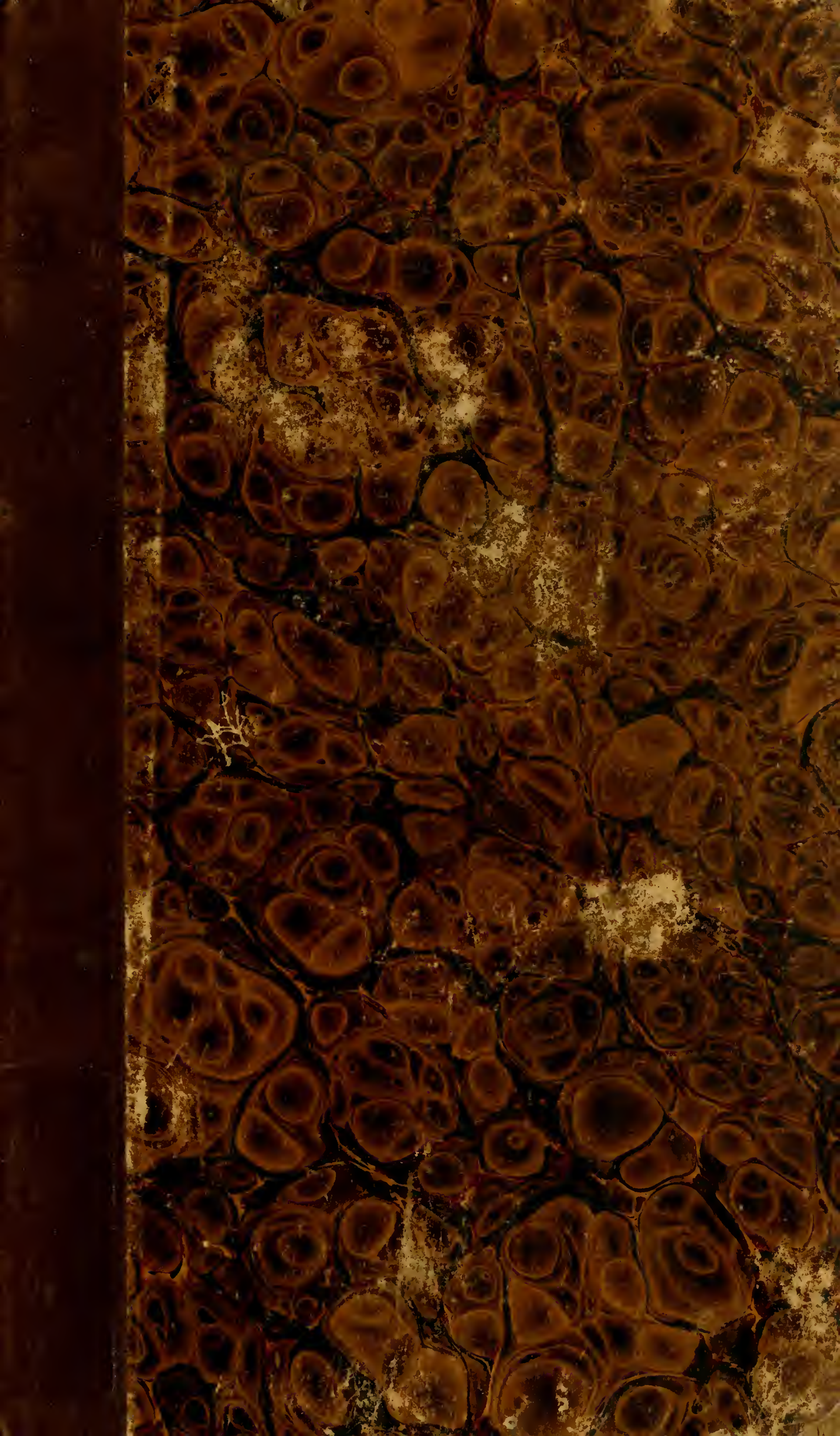

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THE HORSE;

WITH A

TREATISE ON DRAUGHT;

AND

A COPIOUS INDEX.

PUBLISHED UNDER THE SUPERINTENDENCE OF THE SOCIETY
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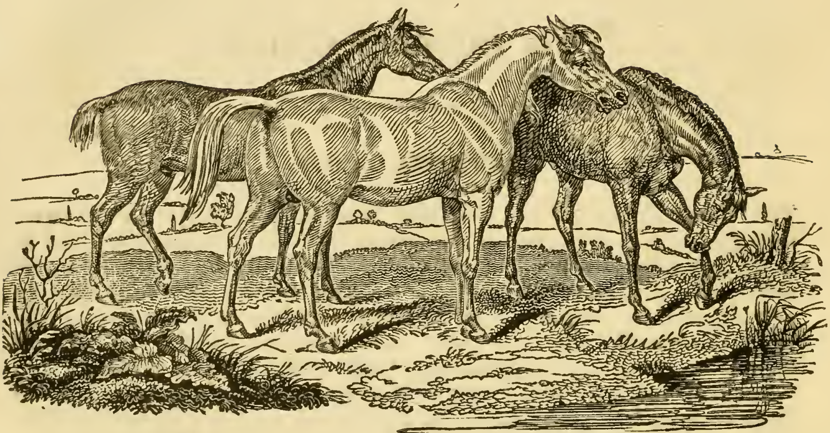
CHAPTER I.

GENERAL HISTORY OF THE HORSE.



Hackney. *Arabian.* *Hunter.*

INTO this and the various breeds of horses, we shall enter at some length; and although the more practical division of the Treatise will be thereby necessarily postponed until the next monthly part, we shall not, even at present, forget the name of the Library to which it belongs, but endeavour to blend the *useful* with the entertaining.

The native country of the horse cannot with certainty be traced. He has been found, varying materially in size, in form, and in utility, in all the temperate, in most of the sultry, and in many of the northern regions of the Old World.

In the Sacred Volume, which, beside its higher claims to stand at the head of the Farmer's Library, contains the oldest authentic record of past transactions, we are told that, so early as 1650 years before the birth of Christ, the horse had been domesticated by the Egyptians. When Joseph carried his father's remains from Egypt to Canaan, "there went up with him both chariots and horsemen *." One hundred and fifty years afterwards, the horse constituted the principal strength of the Egyptian army. Pharaoh pursued the Israelites with "six hundred chosen chariots, and with all the chariots of Egypt †."

If we could believe the accounts of the uninspired historians, Sesostris (the monarch probably whom Joseph served) had twenty-seven thousand chariots of war; and Semiramis, the founder of Babylon, had one hundred thousand chariots, and a million of horsemen; but this was probably a great exaggeration.

Fifty years after the expulsion of the Israelites from Egypt, and 1450 years before the birth of Christ, the horse was so far naturalized in Greece, that the Olympic games were instituted, including chariot and horse races. We have, therefore, sufficient evidence that the horse was, at a very early period, subjected to the dominion of man, and, unfortunately, for the worst of purposes,—the business of war.

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* Gen. i. 9.

† Exod. xvi. 7.

From the records of the Old Testament, we are likewise enabled to ascertain the precise period of time, when in Egypt and Canaan, and the neighbouring countries, this animal began to be domesticated. 1920 years before the birth of Christ, when Abraham, having left Haran, in obedience to the divine command, was driven into Egypt by the famine which raged in Canaan [*], Pharaoh offered him sheep and oxen, and asses and camels. Horses would doubtless have been added, had they then existed, or had they been subdued in Egypt.

When, fifty years afterwards, Abraham journeyed to Mount Moriah, to offer up his only son, he rode upon an ass, which, with all his wealth and power, he would scarcely have done, had the horse been known [†].

Thirty years later, when Jacob returned to Isaac with Rachel and Leah, an account is given [‡] of the number of oxen, sheep, camels, goats, and asses, which he sent to appease the anger of Esau, but not one horse is mentioned.

It is not until twenty-four years after this, when the famine devastated Canaan [||], and Jacob sent into Egypt to buy corn, that horses are first heard of. "Waggons," probably carriages drawn by *horses*, were sent by Joseph into Canaan to bring his father to Egypt. It would seem, however, that horses had been but lately introduced, and were not numerous, or not used as beasts of burden; for the whole of the corn, which was to be conveyed some hundred miles, and was to afford subsistence for Jacob's large household, was carried on asses.

It appears, then, that about 1740 years before Christ, horses were first used in Egypt; but they soon afterwards became so numerous as to form a considerable proportion of the Egyptian army: and when the Israelites returned into Canaan, the horse had been introduced and naturalized there; for the Canaanites "went out to fight against Israel with horses and chariots very many [§]."

The sacred volume, therefore, clears up a point upon which no other record throws any light,—namely, the period when the horse first became the servant of man, at least in one part of the world, and that the most advanced in civilization, and before Greece was peopled. A long time must have elapsed before man was able to ascertain the value and peculiar use of the animals that surrounded him. He would begin with the more subordinate—those which were most easily caught, and most readily subdued; and the benefits which he derived from their labours would induce him to attempt the conquest of superior quadrupeds. In accordance with this, the writings of Moses shew us that, after the ox, the sheep, and the goat, man subdued the ass, and then the camel, and, last of all, the horse became his servant: and no sooner was *he* subdued, and his strength and docility and sagacity appreciated, than the others were comparatively disregarded, except in Palestine, where the use of the horse was forbidden by divine authority, and on extensive and barren deserts, where he could not live [¶].

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[*] Gen. xii. 16.
[†] Gen. xxii. 3.
[‡] Gen. xxxii. 14.
[||] Gen. xlv. 19.
[§] Joshua xi. 4.

[¶] When Sir Gore Ouseley travelled through Persia, and the different countries of the East, he examined, among other relics of antiquity, the sculptures on the ruins of Perse-

From Egypt the use of the horse was propagated to other and distant lands; and, probably, the horse himself was first transmitted from Egypt to several countries. The Greeks affirm, that Neptune struck the earth with his trident, and a horse appeared. The truth is, that the Thessalians, the first and most expert of the Grecian horsemen, and likewise the inhabitants of Argos and of Athens, were colonists from Egypt.

The Bible likewise decides another point, that Arabia, by whose breed of horses those of other countries have been so much improved, was not the native place of the horse. Six hundred years after the time just referred to, Arabia had no horses. Solomon imported spices, gold, and silver, from Arabia*; but all the horses for his own cavalry and chariots, and those with which he supplied the Phœnician monarchs, he procured from Egypt†.

In the seventh century after Christ, when Mahomet attacked the Koreish near Mecca, he had but two horses in his whole army; and at the close of his murderous campaign, although he drove off twenty-four thousand camels, and forty thousand sheep, and carried away twenty-four thousand ounces of silver, not one horse appears in the list of plunder.

There is a curious record of the commerce of different countries at the close of the second century. Among the articles exported from Egypt to Arabia, and particularly as presents to reigning monarchs, were horses.

In the fourth century two hundred Cappadocian horses were sent by the Roman emperor, as the most acceptable present he could offer a powerful prince of Arabia.

So late as the seventh century, the Arabs had few horses, and those of little value. These circumstances sufficiently prove that, however superior may be the present breed, it is comparatively lately that the horse was naturalized in Arabia.

The horses of Arabia itself, and of the south-eastern parts of Europe, are clearly derived from Egypt; but whether they were there bred, or imported from the south-western regions of Asia, or, as is more probable, brought from the interior, or northern coasts of Africa, cannot with certainty be determined.

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polis, and he draws from them a curious and interesting conclusion as to the *manner* in which the horse was gradually subdued. "There are no figures," says he, "mounted on horseback, although some travellers have mentioned horsemen among those sculptures. One would think that the simple act of mounting on a horse's back would naturally have preceded the use of wheel-carriages and their complicated harness; yet no horsemen are found at Persepolis; and we know Homer's horses are represented in chariots from which the warriors sometimes descended to combat on foot, but the poet has not described them as fighting on horseback. The absence of mounted figures might authorize an opinion that those sculptures had been executed before the time of Cyrus, whose precepts and example first inspired the Persians with a love of equestrian exercises, of which, before his time, they were wholly ignorant."—vol. ii. p. 276.

* 2 Chron. ix. 14. † 2 Chron. i. 17.

† The historian gives us the price of the horse and the chariot at that time. A horse brought from Egypt, including, probably, the expense of the journey, cost one hundred and fifty shekels of silver, which, at two shillings, three pence, and one half farthing each, amounts to about seventeen pounds two shillings. A chariot cost six hundred shekels, or sixty-eight pounds, eight shillings; a most enormous sum at that early period, but little to him who expended more than thirty-five millions of pounds, in gold alone, to ornament the Temple which he had built.

CHAPTER II.

THE DIFFERENT FOREIGN BREEDS OF HORSES.

THE WILD HORSE.

TROOPS of wild horses are found in the plains of Great Tartary, and also in several parts of South America. In neither, however, can we recognise an original race. The horses of the Ukraine, and those of South America, are equally the descendants of those who had escaped from the slavery of man. The Tartar horses are fleet and strong, but comparatively of an ordinary breed. Those of South America retain, almost unimpaired, the size and form of their European ancestors.

In no part of America, or of the more newly-discovered islands of the Pacific, was the horse known, until he was introduced by Europeans; and the origin of the horses of Tartary has been clearly traced to those who were employed in the siege of Azoph, in 1657, but which were turned loose for want of forage.

All travellers, who have crossed the plains extending from the shores of La Plata to Patagonia, have spoken of numerous droves of wild horses. Some affirm that they have seen ten thousand in one troop. They appear to be under the command of a leader, the strongest and boldest of the herd, and whom they implicitly obey. A secret instinct teaches them that their safety consists in their union, and in a principle of subordination. The lion, the tiger, and the leopard*, are their principal enemies. At some signal, intelligible to them all, they either close into a dense mass, and trample their enemy to death; or, placing the mares and foals in the centre, they form themselves into a circle and welcome him with their heels. In the attack, their leader is the first to face the danger, and, when prudence demands a retreat, they follow his rapid flight.

In the thinly inhabited parts of South America it is dangerous to fall in with any of these troops. The wild horses approach as near as they dare: they call to the loaded horse with the greatest eagerness, and, if the rider be not on the alert, and have not considerable strength of arm, and sharpness of spur, his beast will divest himself of his burden, take to his heels, and be gone for ever.

Captain Head gives the following account of a meeting with a troop of wild horses, where the country is more thickly inhabited. Some poor captured animals are supposed to be forced along by their riders at their very utmost speed:—"As they are thus galloping along, urged by the spur, it is interesting to see the groups of wild horses one passes. The mares, which are never ridden in South America, seem not to understand what makes the poor horse carry his head so low, and look so weary †. The little innocent colts come running to meet him, and then start away frightened: while the old horses, whose white marks on the flanks and backs betray their acquaintance with the spur and saddle, walk slowly away for some distance, then, breaking into a trot as they seek their safety, snort and look behind them, first with one eye and then with the other, turning their nose from right to left, and carrying their long tail high in the air *."

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* These animals are of a different race from those which go under the same names in the Old World, and are very inferior in strength.

† An Englishman once attempted to ride a mare, but he was hooted and pelted by the natives, and thought himself fortunate to escape without serious injury.

Sir John Carr, in his Northern Summer, p. 44, states that it is only a short time since mares began to be ridden in Russia.

The same pleasing writer describes the system of horse-management among the rude inhabitants of the plains of South America. They have no stables, no fenced pastures. One horse is usually kept tied at the door of the hut, fed scantily at night on maize; or at other times several may be enclosed in the *corral*, which is a circular space surrounded by rough posts, driven firmly into the ground. The mares are never ridden, or attempted to be tamed, but wander with their foals wherever they please.

When the *Gaucho*, the native inhabitant of the plains, wants horses for himself or for the supply of the traveller, he either goes with his *lasso* to the *corral*, and selects those, possibly, who on the preceding day had for the first time been backed, or he scampers across the plain, and presently returns with an unwilling, struggling, or subdued captive. When the services of the animals have been exacted, he either takes them to the *corral*, and feeds them with a small quantity of maize, if he thinks he shall presently need them again, or he once more turns them loose on the plains.

Travellers give some amusing accounts of the manner in which all this is effected—Miers † thus describes the *lasso*, simple in its construction, but all-powerful in the hands of the Gaucho.

" The *Lasso* is a missile weapon used by every native of the United Provinces and Chile. It is a very strong plaited thong of equal thickness, half an inch in diameter, and forty feet long; made of many strips of green hide, plaited like a whipthong, and rendered supple by grease. It has, at one end, an iron ring above an inch and a half in diameter, through which the thong is passed, and this forms a running noose. The Gaucho, or native Peon, is generally mounted on horseback when he uses the lasso. One end of the thong is affixed to his saddle girth: the remainder he coils carefully in his left hand, leaving about twelve feet belonging to the noose-end, in a coil, and a half of which he holds in his right hand. He then swings this long noose horizontally round his head, the weight of the iron ring at the end of the noose assisting in giving to it, by a continued circular motion, a sufficient force to project it the whole length of the line."

When the Gauchos wish to have a grand breaking-in, they drive a whole herd of wild horses into the corral.—" The corral was quite full of horses, most of which were young ones about two or three years old. The *capitar* (chief Gaucho), mounted on a strong steady horse, rode into the corral and threw his lasso over the neck of a young horse, and dragged him to the gate. For some time he was very unwilling to leave his comrades; but the moment he was forced out of the corral, his first idea was to gallop away: however a timely jerk of the lasso checked him in the most effectual way. The peons now ran after him on foot and threw a lasso over his fore-legs just above the fetlock, and twitching it, they pulled his legs from under him so suddenly, that I really thought the fall he got had killed him. In an instant a Gaucho was seated on his head, and with his long knife, and in a few seconds, cut off the whole of the horse's mane, while another cut the hair from the end of his tail. This they told me was a mark that the horse had been once mounted. They then put a piece of hide into his mouth to serve for a bit, and a strong hide halter on his head. The Gaucho who was to mount, arranged his spurs, which were unusually long and sharp*, and while two men held the horse by his ears, he put on the saddle, which he girthed extremely tight. He then caught hold of the horse's ear, and in an instant vaulted into the saddle; upon which the man who held the horse by the halter threw the end to the rider, and from that moment no one seemed to take any further notice of him.

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* Head's Journey across the Pampas, p. 258. † Miers' Travels in Chile, vol. i. p. 88

"The horse instantly began to jump in a manner which made it very difficult for the rider to keep his seat, and quite different from the kick or plunge of an English horse: however, the Gaucho's spurs soon set him going, and off he galloped, doing everything in his power to throw his rider

"Another horse was immediately brought from the corral, and so quick was the operation, that twelve Gauchos were mounted in a space which I think hardly exceeded an hour. It was wonderful to see the different manner in which different horses behaved. Some would actually scream while the Gauchos were girding the saddle upon their backs; some would instantly lie down and roll upon it; while some would stand without being held—their legs stiff, and in unnatural positions, their necks half bent towards their tails, and looking vicious and obstinate; and I could not help thinking that I would not have mounted one of those for any reward that could be offered me, for they were invariably the most difficult to subdue.

"It was now curious to look around and see the Gauchos on the horizon in different directions, trying to bring their horses back to the corral, which is the most difficult part of their work; for the poor creatures had been so scared there that they were unwilling to return to the place. It was amusing to see the antics of the horses—they were jumping and dancing in different ways, while the right arm of the Gauchos was seen flogging them. At last they brought the horses back, apparently subdued, and broken in. The saddles and bridles were taken off, and the young horses trotted off towards the corral, neighing to one another†."

When the Gaucho wishes to take a wild horse, he mounts one that has been used to the sport, and gallops over the plain. As soon as he comes sufficiently near his prey, "the lasso is thrown round the two hind legs, and as the Gaucho rides a little on one side, the jerk pulls the entangled horse's feet laterally, so as to throw him on his side, without endangering his knees or his face. Before the horse can recover the shock, the rider dismounts, and snatching his *poncho* or cloak from his shoulders, wraps it round the prostrate animal's head. He then forces into his mouth one of the powerful bridles of the country, straps a saddle on his back, and bestriding him, removes the poncho; upon which the astonished horse springs on his legs, and endeavours by a thousand vain efforts to disencumber himself of his new master, who sits quite composedly on his back, and, by a discipline which never fails, reduces the horse to such complete obedience, that he is soon trained to lend his whole speed and strength to the capture of his companions.‡"

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* The manufacture of the Gaucho's boots is somewhat singular.—"The boots of the Gauchos are formed of the ham and part of the leg-skin of a colt taken reeking from the mother, which is said to be sacrificed for the sole purpose, just at the time of bearing, when the hair has not begun to grow. At this stage, the skin strips off easily, and is very white and beautiful in texture and appearance. The ham forms the calf of the boot; the hock easily adopts itself to the heel, and the leg above the fetlock constitutes the foot; the whole making a neat and elegant half-boot, with an aperture sufficient for the great toe to project through."—Andrews's Journey in South America, vol. i. p. 26.

† Head's Journey across the Pampas, p. 258.

‡ Basil Hall's Journey to Peru and Mexico, vol. i. p. 151. The Jesuit Dobrizhoffer, in his History of the Abipones, a nation of Paraguay, and speaking of the tamed horse, (vol. ii. p. 113,) says, that " stirrups are not in general use. The men leap on their

These animals possess much of the form of the Spanish horse, from which they sprung; they are tamed, as has been seen, with far less difficulty than could be thought possible; and, although theirs is the obedience of fear, and enforced at first by the whip and spur, there are no horses who so soon and so perfectly exert their sagacity and their power in the service of man. They are possessed of no extraordinary speed, but they are capable of enduring immense fatigue. They are frequently ridden 60 or 70 miles without drawing bit, and have been urged on by the cruel spur of the Gaucho, more than a hundred miles, and at the rate of twelve miles in the hour.

Like the Arab horses, they know no intermediate pace between the walk and the gallop. Although at the end of a day so hard, their sides are horribly mangled, and they completely exhausted, there is this consolation for them,—they are immediately turned loose on the plains, and it will be their own fault if they are speedily caught again. The mare is occasionally killed for food, and especially on occasions of unusual festivity. General San Martin, during the war for independence, gave a feast to the Indian allies attached to his army; and mares' flesh, and the blood mixed with gin, formed the whole of the entertainment.

On such dry and sultry plains the supply of water is often scanty, and then a species of madness seizes on the horses, and their generous and docile qualities are no longer recognized. They rush violently into every pond and lake, savagely mangling and trampling upon one another; and the carcases of many thousands of them, destroyed by their fellows, have occasionally been seen in and around a considerable pool. This is one of the means by which the too rapid increase of this quadruped is, by the ordinance of Nature, there prevented.

The wild horses of TARTARY, although easily domesticated, materially differ in character from those on the plains of South America. They will not suffer a stranger to join them. If a domesticated horse comes in their way, unprotected by his master, they attack him with their teeth and their heels, and speedily destroy him. They readily submit, however, to the dominion of man, and become perfectly docile and faithful.

Among the Tartars, the flesh of the horse is a frequent article of food; and although they do not, like the Indians of the Pampas, eat it raw, their mode of cookery would not be very inviting to the European epicure. They cut the muscular parts into slices, and place them under their saddles, and after they have galloped thirty or forty miles, the meat becomes tender and sodden, and fit for their table; and, at all their feasts, the first and last and most favourite dish, is a horse's head.

When water was not at hand, the Scythians used to draw blood from their horses, and drink it; and the dukes of Muscovy, for nearly two hundred and sixty years, presented Tartar ambassadors with the milk of mares. If any of this milk fell upon the mane of the horse, the duke, by custom, was bound to lick it off.

Troops of wild horses are occasionally met with in the central parts of Africa, in the island of St. Domingo, on the deserts of Arabia, and in a few other parts of the world; but no where do they equal the domesticated horse in form, strength, or even speed.

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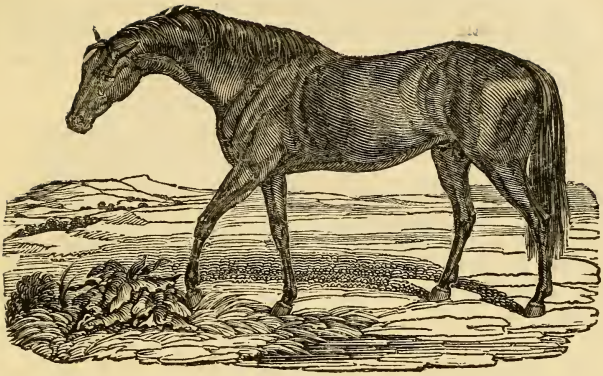
horse on the *right* side. In the right hand they grasp the bridle, and in the left a very long spear, leaning on which, they jump with the impulse of both feet, and then fall right upon the horse's back."

THE BARB.



The Godolphin Arabian.

It has already been stated, that the earliest records we have of the horse trace him to Egypt, whence he gradually found his way to Arabia and Persia, and the provinces which were colonized from Egypt; and thence to the other parts of the old world. But Egypt is not now a breeding country, and it does not appear to possess those requisites which could ever have constituted it one. Without, however, entering into the question whether the horse was primarily the inhabitant of some particular region, whence other parts were gradually supplied, or whether it was common to many countries, but differing in each; we have stated it to be probable that the horses of Egypt, the earliest on record, were derived from the neighbouring and interior districts of Africa. Therefore, in giving a very summary account of the most celebrated and useful breeds of different countries, it is natural to begin with those of Africa.

At the head of these is the **Barb**, from Barbary, and particularly from Morocco and Fez, and the interior of Tripoli; and remarkable for his fine and graceful action. It is rather lower than the Arabian, seldom exceeding fourteen hands and an inch. The shoulders are flat, the chest round, the joints inclined to be long, and the head particularly beautiful. The Barb is decidedly superior to the Arab in form, but has not his spirit, or speed, or countenance.

The Barb has chiefly contributed to the excellence of the Spanish horse; and, when the improvement of the breed of horses began to be systematically pursued in Great Britain, the Barb was very early introduced. The Godolphin Arabian, as he is called, of whom we have presented our readers with a cut, and who was the origin of some of our best racing blood, was a Barb; and others of our most celebrated turf-horses trace their descent from African mares.

More in the centre of Africa, in the kingdom of Bournou, is a breed, which Mr. Tully, in his almost romantic history of Tripoli, reckons superior even to those of Arabia or Barbary; it possesses the best qualities of both those breeds, being as serviceable as that of Arabia, and as beautiful as that of Barbary.

In the more southern and western districts of Africa, and particularly in the neighbourhood of the Guinea Coast, the breed of horses is very inferior. They are small, weak, unsafe, and untractable. But neither horses, nor any other produce of value, can be looked for in those unhappy countries, so long as they are desolated by the infernal slave-trade inflicted upon them by the most civilized, but truly unchristian, nations of Europe.

THE DONGOLA HORSE.

The kingdom of Dongola, and the neighbouring districts lying between Egypt and Abyssinia, contain a horse not at all like any other oriental.

The "Dongola horses stand full sixteen hands high, but the length of the body, from the shoulders to the quarter, is considerably less. Their form, therefore, is opposite to that of the Arabian, or English thorough-bred, which are longer by some inches than they are high. The neck is long and slender, the crest fine, and the withers sharp and high, giving a beautiful forehand; but the breast is too narrow, the quarters and flanks too flat, and the back *carped*. They constitute excellent war-horses, from their speed, durability, and size. Several of them have lately been imported into Europe, but they are little valued. Possibly, with three-part-bred mares, they might improve our cavalry horses."

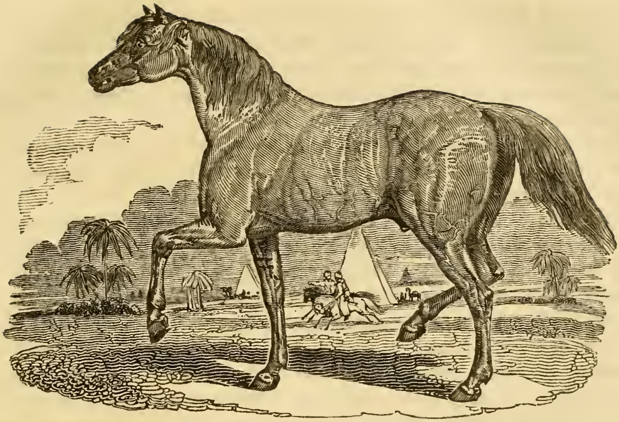
Bosman, whose descriptions prove him to be no bad horseman, thus speaks of them, but in somewhat too flattering a manner. "The Dongola horses are the most perfect in the world, being beautiful, symmetrical in their parts, nervous and elastic in their movements, and docile and affectionate in their manners. One of these horses was sold in 1816, at Grand Cairo, for a sum equivalent to 1000*l.*"

Mr. Bruce tells us, that the best African horses are said to be descended from one of the five on which Mahomet and his four immediate successors fled from Mecca to Medina, on the night of the Hegira. He thus accounts for very singular and opposite customs among the Arabs and Africans.

"No Arab ever mounts a stallion: on the contrary, in Africa they never ride mares. The reason is plain.—The Arabs are constantly at war with their neighbours, and always endeavour to take their enemies by surprise in the grey of the evening, or the dawn of day. A stallion no sooner smells the stale of the mare in the enemy's quarters, than he begins to neigh, and that would give the alarm to the party intended to be surprised. No such thing can ever happen when they ride mares only. On the contrary, the Funge trust only to superior force. They are in an open, plain country—must be discovered at many miles distance—and all such surprises and stratagems are useless to them."

THE ARABIAN.

Going further eastward we arrive at Arabia, whose horses deservedly occupy the very highest rank.



The Wellesley Arabian.

A few wild horses are yet seen on some of the deserts of Arabia. They are hunted by the Bedouins for their flesh, which is considered a delicacy, if the animal be young; and also to increase their stock of inferior horses, which they often palm on the merchant as descended from the sacred breed. They are said to be even swifter than the domesticated horse, and are usually taken by traps hidden in the sand. Mr. Bruce, however, doubts whether any wild horses are now found in Arabia Deserta*.

Although in the seventh century the Arabs had no horses of value, yet the Cappadocian and other horses, which they had derived from their neighbours, were preserved with so much care, and propagated so uniformly and strictly from the finest of the breed, that in the thirteenth century the Arabian horse began to assume a just and unrivalled celebrity.

There are said to be three breeds or varieties of Arabian horses:—the *Attechi*, or inferior breed, on which they set little value, and which are found wild on some parts of the deserts; the *Kadischi*, literally horses of an unknown race, answering to our half-bred horses—a mixed breed; and the *Kochlani*, horses whose genealogy, according to the Arab account, is known for two thousand years. Many of them have written and attested pedigrees extending more than four hundred years, and, with true Eastern exaggeration, traced by oral tradition from the stud of Solomon. A more careful account is kept of these genealogies than belongs to the most ancient family of the proudest Arab chief, and very singular precautions are taken to prevent the possibility of fraud, so far as the written pedigree extends.

The *Kochlani* are principally reared by the Bedouin Arabs, in the remoter deserts. A stallion may be procured without much difficulty, although at a great price. A mare is rarely to be obtained, except by fraud and excessive bribery. The Arabs have found out that which the English breeder should never forget, that the female is more concerned than the male in the excellence and value of the produce; and the genealogies of their horses are always reckoned from the mothers.

The Arabian horse would not be acknowledged by every judge to possess a perfect form: his head, however, is inimitable. The broadness and squareness of the forehead, the shortness and fineness of the muzzle, the prominence and brilliancy of the eye, the smallness of the ears, and the beautiful course of the veins, will always characterise the head of the Arabian horse.

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* Bruce's Travels, vol. vi. p. 430.

His body may be considered as too light, and his chest as too narrow; but behind the arms the barrel generally swells out, and leaves sufficient room for the play of the lungs.

In the formation of the shoulder, next to that of the head, the Arab is superior to any other breed. The withers are high, and the shoulder-blade inclined backward, and so nicely adjusted, that in descending a hill the point or edge of the ham never ruffles the skin. He may not be thought sufficiently high; he seldom stands more than fourteen hands two inches.

The fineness of his legs, and the oblique position of his pasterns, may be supposed to lessen his apparent strength; but the leg, although small, is flat and wiry; anatomists know that the bone has no common density, and the starting muscles of the fore-arm and the thigh indicate that he is fully capable of accomplishing many of the feats which are recorded of him.

The Barb alone excels him in noble and spirited action; and if there be defects about him, he is perfect for that for which he was designed. He presents the true combination of speed and bottom—strength enough to carry more than a light weight, and courage that would cause him to die rather than to give up.

We may not, perhaps, believe all that is told us of the Arabian. It has been remarked, that there are on the deserts which this horse traverses no mile-stones to mark the distance, or watches to calculate the time; and the Bedouin is naturally given to exaggeration, and, most of all, when relating the prowess of the animal, which he loves as dearly as his children: yet it cannot be denied that, at the introduction of the Arabian into the European stables, there was no other horse comparable to him.

The Arab horse is as celebrated for his docility and good temper as for his speed and courage. In that delightful book, 'Bishop Heber's Narrative of a Journey through the Upper Provinces of India,' the following interesting character is given of him. "My morning rides are very pleasant. My horse is a nice, quiet, good-tempered little Arab, who is so fearless, that he goes without starting close to an elephant, and so gentle and docile that he eats bread out of my hand, and has almost as much attachment and coaxing ways as a dog. This seems the general character of the Arab horses, to judge from what I have seen in this country. It is not the fiery dashing animal I had supposed, but with more rationality about him, and more apparent confidence in his rider, than the majority of English horses."

The kindness with which he is treated from a foal, gives him an affection for his master, a wish to please, a pride in exerting every energy in obedience to his commands, and, consequently, an apparent sagacity which is seldom seen in other breeds. The mare and her foal inhabit the same tent with the Bedouin and his children. The neck of the mare is often the pillow of the rider, and, more frequently, of the children, who are rolling about upon her and the foal: yet no accident ever occurs, and the animal acquires that friendship and love for man which occasional ill-treatment will not cause him for a moment to forget.

When the Arab falls from his mare, and is unable to rise, she will immediately stand still, and neigh until assistance arrives. If he lies down to sleep, as fatigue sometimes compels him, in the midst of the desert, she stands watchful over him, and neighs and rouses him if either man or beast approaches. An old Arab had a valuable mare that had carried him for fifteen years in many a hard-fought battle, and many a rapid weary march; at length, eighty years old, and unable longer to ride her, he gave her, and a scimitar that had been his father's, to his eldest son, and told him to appreciate their value, and never lie down to rest until he had rubbed them both as bright as a looking-glass. In the first skirmish in which the young man was engaged he was killed, and the mare fell into the hands of the enemy. When the news reached the old man, he exclaimed that "life was no longer worth preserving, for he had lost both his son and his mare, and he grieved for one as much as the other;" and he immediately sickened and died*.

Man, however, is an inconsistent being. The Arab who thus lives with and loves his horses, regarding them as his most valuable treasure, sometimes treats them with a cruelty scarcely to be believed, and not at all to be justified. The severest treatment which the English racehorse endures is gentleness compared with the trial of the young Arabian. Probably the filly has never before been mounted; she is led out; her owner springs on her back, and goads her over the sand and rocks of the desert at full speed for fifty or sixty miles without one moment's respite. She is then forced, steaming and panting, into water deep enough for her to swim. If, immediately after this, she will eat as if nothing had occurred, her character is established, and she is acknowledged to be a genuine descendant of the *Kochlani* breed. The Arab is not conscious of the cruelty which he thus inflicts. It is an invariable custom, and custom will induce us to inflict many a pang on those whom, after all, we love.

The following anecdote of the attachment of an Arab to his mare has often been told, but it comes home to the bosom of every one possessed of common feeling. "The whole stock of an Arab of the desert consisted of a mare. The French consul offered to purchase her in order to send her to his sovereign, Louis XIV. The Arab would have rejected the proposal at once with indignation and scorn; but he was miserably poor. He had no means of supplying his most urgent wants, or procuring the barest necessaries of life. Still he hesitated;—he had scarcely a rag to cover him—and his wife and his children were starving. The sum offered was great,—it would provide him and his family with food for life. At length, and reluctantly, he consented. He brought the mare to the dwelling of the consul,—he dismounted,—he stood leaning upon her;—he looked now at the gold, and then at his favourite; he sighed—he wept. 'To whom is it,' said he, 'I am going to yield thee up? To Europeans, who will tie thee close,—who will beat thee,—who will render thee miserable. Return with me, my beauty, my jewel, and rejoice the hearts of my children.' As he pronounced the last words, he sprung upon her back, and was out of sight in a moment."

The next anecdote is scarcely less touching, and not so well known. Ibrahim, a poor but worthy Arab, unable to pay a sum of money which he owed, was compelled to allow a merchant of Rama to become partner with him in a valuable mare. When the time came, he could not redeem his pledge to this man, and the mare was sold. Her pedigree could be traced on the side of sire and dam for full five hundred years. The price was three hundred pounds; an enormous sum in that country. Ibrahim went frequently to Rama to inquire after the mare: he would embrace her,—wipe her eyes with his handkerchief,—rub her with his shirt sleeves,—and give her a thousand benedictions during whole hours that he remained talking to her. 'My eyes!' would he say to her, 'my soul! my heart! must I be so unfortunate as to have thee sold to so many masters and not keep thee myself? I am poor, my antelope! I brought thee up in my dwelling as my child. I did never beat nor chide thee; I caressed thee in the proudest manner. God preserve thee, my beloved! thou art beautiful, thou art sweet, thou art lovely! God defend thee from envious eyes!"

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* Smith on Breeding, p. 80.

Sir John Malcolm gives two anecdotes to the same purpose, but of a more amusing nature.

"When the envoy, returning from his former mission, was encamped near Bagdad, an Arab rode a bright bay mare of extraordinary shape and beauty before his tent, until he attracted his attention. On being asked if he would sell her;—'What will you give me?' was the reply: 'That depends upon her age; I suppose she is past five?'—'Guess again,' said he. 'Four?' 'Look at her mouth,' said the Arab, with a smile. On examination she was found to be rising three. This, from her size and symmetry, greatly enhanced her value. The envoy said, 'I will give you fifty tomans' (a coin nearly of the value of a pound sterling). 'A little more if you please,' said the fellow, apparently entertained. 'Eighty. A hundred.' He shook his head and smiled. The offer at last came to two hundred tomans! 'Well,' said the Arab, 'you need not tempt me further;—it is of no use.—You are a rich elchee (nobleman). You have fine horses, camels, and mules, and, I am told, you have loads of silver and gold. Now,' added he, 'you want my mare, but you shall not have her for all you have got*."

"An Arab sheick or chief, who lived within fifty miles of Bussorah, had a favourite breed of horses. He lost one of his best mares, and could not for a long while discover whether she was stolen or had strayed. Some time after, a young man of a different tribe, who had long wished to marry his daughter, but had always been rejected by the sheick, obtained the lady's consent and eloped with her. The sheick and his followers pursued, but the lover and his mistress, mounted on one horse, made a wonderful march, and escaped. The old chief swore that the fellow was either mounted upon the devil, or the favourite mare he had lost. After his return, he found the latter was the case; that the lover was the thief of his mare as well as his daughter; and that he stole the one to carry off the other. The chief was quite gratified to think he had not been beaten by a mare of another breed; and was easily reconciled to the young man, in order that he might recover the mare, which appeared an object about which he was more solicitous than about his daughter†."

One of our own countrymen, the enterprising traveller, Major Denham, affords us a pleasing instance of the attachment with which the docility and sagacity of the horse may inspire the owner.—He thus relates the death of his favourite Arabian, in one of the most desert spots of Central Africa. His feelings needed no apology. We naturally honour the man in whom true sensibility and undaunted courage, exerted for useful purposes, were thus united.

"There are a few situations in a man's life in which losses of this nature are felt most keenly; and this was one of them. It was not grief, but it was something very nearly approaching to it; and though I felt ashamed of the degree of derangement I suffered from it, yet it was several days before I could get over the loss. Let it, however, be remembered that the poor animal had been my support and comfort,—nay, I may say, companion, through many a dreary day and night;—had endured both hunger and thirst in my service; and was so docile, that he would stand still for hours in the desert while I slept between his legs, his body affording me the only shelter that could be obtained from the powerful influence of a noon-day sun:—he was yet the fleetest of the fleet, and ever foremost in the chase."

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* Malcolm's Sketches of Persia, vol. i. p. 41. † Ibid. p. 45.

Our horses would fare badly on the scanty nourishment afforded the Arabian. The mare usually has but one or two meals in twenty-four hours. During the day she is tied to the door of the tent, ready for the Bedouin to spring, at a moment's warning, into the saddle; or she is turned out before the tent ready saddled, the bridle merely taken off, and so trained that she gallops up immediately at her master's call. At night she receives a little water; and with her scanty provender of five or six pounds of barley or beans, and sometimes a little straw, she lies down content, in the midst of her master's family. She can, however, endure great fatigue; she will travel fifty miles without stopping; she has been pushed, on emergency, one hundred and twenty miles, and, occasionally, neither she nor her rider has tasted food for three whole days.

To the Arabian, principally, England is indebted for her improved and now unrivalled breed of horses for the turf, the field, and the road, as will be shewn when we presently treat of the English horse.

THE EAST INDIAN HORSE.

We will now travel further eastward, and look at the breeds of horses in our Indian possessions. First, we have the *Toorky*, originally from a Toorkoman and a Persian, beautiful in his form, graceful in his action, and docile in his temper. It is said that, when skilfully managed, the grandeur and stateliness of his carriage are equal to what the warmest imagination can conceive of the horse: his spirit rising as his exertions are required, he exhibits to his beholders an appearance of fury in the performance of his task, yet preserving to his rider the utmost playfulness and gentleness.

Next comes the *Iranee*, well limbed, and his joints closely knit, and particularly powerful in the quarters, but with scarcely sufficient spirit, and his ears large and loose.

The patient and docile *Cozakee* is deep in the girth, powerful in the forearm, but with large head, and sadly cat-hammed; hardy, and calculated for long journeys and severe service.

The *Mojinniss* have spirit, beauty, speed, and perseverance.

The *Tazsee* is slight, hollow-backed, and, for that reason perhaps, although deficient in strength, and leaving as it were his hind legs behind him, and likewise irritable in temper, yet sought after on account of the peculiar easiness of his pace.

A sale of horses near the Company's stud, at Hissar, is thus described by an excellent judge. "Not less than one thousand horses were shewn. They were all above fourteen hands and a half in height, high-crested, and shewy-looking horses. The great defect seemed a want of bone below the knee, which is indeed general to all the native horses throughout India; and also so great a tendency to fulness in the hocks, that, in England, it would be thought half of them had blood spavins."

THE CHINESE HORSE.

This breed is small, weak, ill-formed, without spirit, and altogether undeserving of notice.

THE PERSIAN HORSE.

Returning westward we find the Persian next in estimation, and deservedly so, to the Arabian. The head is almost equally beautiful, the crupper superior; he is equal in speed, but far inferior in endurance. The whole frame is more developed than in the Arabian.

The Persian horses were celebrated for many a century before the Arabians were known, or even existed. They constituted, in ancient times, the best cavalry of the East. The native Persian was so highly prized, that Alexander considered one of them the noblest gift he could bestow; and when the kings of Parthia would propitiate their divinities by the most costly sacrifice, a Persian horse was offered on the altar. An entertaining traveller (Sir R. Ker Porter) bears testimony that they have not now degenerated. He gives the following account of this breed.

"The Persian horses never exceed fourteen or fourteen and a half hands high, yet certainly, in the whole, are taller than the Arabs. Those of the desert and country about Hillah run very small, but are full of bone and of good speed. General custom feeds and waters them only at sun-rise and sun-set, when they are cleaned. Their usual provender is barley and chopped straw, which, if the animals are piqueted, is put into a nose-bag and hung from their heads; but if stabled, it is thrown into a small lozenge-shaped hole left in the thickness of the mud-wall for that purpose, but much higher up than the line of our mangers, and there the animal eats at his leisure. Hay is a kind of food not known here. The bedding of the horse consists of his dung. After being exposed to the drying influence of the sun during the day, it becomes pulverized, and, in that state, is nightly spread under him*. Little of it touches his body, that being covered by his clothing, a large *nummud* from the ears to the tail, and bound firmly round his body by a very long surcingle. But this apparel is only for cold weather; in the warmer season the night-clothes are of a lighter substance, and during the heat of the day, the animal is kept entirely under shade.

"At night he is tied in the court yard. The horses' heads are attached to the place of security by double ropes from their halters, and the heels of their hinder legs are confined by cords of twisted hair, fastened to iron rings, and pegs driven into the earth. The same custom prevailed in the time of Xenophon, and for the same reason, to secure them from being able to attack and maim each other, the whole stud generally consisting of stallions. Their keepers, however, always sleep on their rugs amongst them to prevent accident; and sometimes, notwithstanding all this care, they manage to break loose, and then the combat ensues. A general neighing, screaming, kicking, and snorting, soon rouses the grooms, and the scene for awhile is terrible. Indeed no one can conceive the sudden uproar of such a moment who has not been in Eastern countries to hear it, and then all who have, must bear me witness that the noise is tremendous. They seize, bite, and kick each other with the most determined fury, and frequently cannot be separated before their heads and haunches stream with blood. Even in skirmishes with the natives, their horses take part in the fray, tearing each other with their teeth, while their masters are in similar close quarters on their backs."

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* It is the usual flooring of the stable and the tent. The united influence of the sun and air deprive it of all unpleasant odour, and when from use it becomes a second time offensive, it is again exposed to the sun, and all unpleasant smell once more taken away.

His description of a Persian race does not altogether remind us of Newmarket or Doncaster.

" My curiosity was fully on the spur to see the racers, which I could not doubt must have been chosen from the best in the nation to exhibit the perfection of its breed before the sovereign. The rival horses were divided into three sets, in order to lengthen the amusement. They had been in training for several weeks, going over the ground very often during that time; and when I did see them, I found so much pains had been taken to sweat and reduce their weight, that their bones were nearly cutting the skin. The distance marked for the race was a stretch of four-and-twenty miles, and, that his majesty might not have to wait when he had reached the field, the horses had set forward long before, by three divisions, from the starting point, (a short interval of time passing between each set,) so that they might begin to come in, a few minutes after the king had taken his seat. The different divisions arrived in regular order at the goal, but all so fatigued and exhausted, that their former boasted fleetness hardly exceeded a moderate canter when they passed before the royal eyes."

In Circassia almost every family of distinction, whether of princes or nobles, boasts of possessing a peculiar race of horses, which, when young, are burned on the buttock with a particular mark. On this occasion, they act with the most scrupulous adherence to custom, so that a person who should attempt to burn a character expressing noble descent, on a filly of a common race, would, for such forgery, forfeit his life. The most celebrated race of Circassian horses has received the name of Shalokh, and is in the exclusive possession of the Tau Sultan family. This race is valuable for its strength and swiftness, more than its peculiar beauty. Its distinguishing mark is a full horse-shoe, without an arrow.

THE TOORKOMAN HORSE.

Turkistan is that part of South Tartary, north-east of the Caspian sea, and has been celebrated from very early times, for producing a pure and valuable breed of horses. They are called *Toorkomans.* They are said to be preferable even to the pure Persians, for service. They are large, standing from fifteen to sixteen hands high; swift, and inexhaustible under fatigue. Some of them have travelled nine hundred miles in eleven successive days. They, however, are somewhat too small in the barrel,—too long on the legs,—occasionally ewe-necked, and always have a head out of proportion large: yet, such are the good qualities of the horse, that one of the pure blood is worth two or three hundred pounds, even in that country.

Captain Fraser, who is evidently a good judge of the horse, (in his

Journey to Khorasan) thus relates the impression which they made on him: "They are deficient in compactness. Their bodies are long in proportion to their bulk. They are not well-ribbed up. They are long on the legs, —deficient in muscle,—falling off below the knee;—narrow chested,—long necked,—head large, uncouth, and seldom well put on. Such was the impression I received from the first sight of them, and it was not for some time that their superior valuable qualities were apparent to me."

THE TARTAR AND CALMUCK HORSE.

The horses of the other parts of Tartary, comprehending the immense plains of Central Asia, and a considerable part of European Russia, are little removed from a wild state: they are small and badly made; but capable of supporting the longest and most rapid journey, on the scantiest fare. The foals, from the earliest period, are exposed to the inclemency of the weather, have little to eat, and follow their dams in the longest excursions, and, therefore, soon acquire a very great power of sustaining fatigue. They must be hardy for another reason. The Tartars live much on the flesh of horses, and, consequently, those animals that are unable to support the labour of their frequent rapid emigrations are soon destroyed, and only the more vigorous preserved.

The horses, which range at large over the plains, are divided into herds, at the head of which are placed two stallions, who carefully prevent them from intermingling with each other, and it is rarely that a foal is lost. On the approach of a strange herd, the stallions drive their own into a close body, place themselves in front, and, if necessary, attack and drive off the others. As the stallion-foals grow up, they are driven away from the herd, and are seen straggling about at a distance, until they are strong enough to form herds of wild mares for themselves.

These horses, or those of a similar breed and habits, were beaten by not the first-rate English blood-horses, in a race which fairly put to the test both their speed and stoutness. On the 4th of August, 1825, a race of the cruel distance of more than forty-seven miles was run between two Cossack and two thorough-bred English horses—Sharper and Mina. The most celebrated Cossack horses from the Don, the Black Sea, and the Ural, were sent; and, after numerous trials, the best were selected. On starting, the Cossacks took the lead at a moderate pace, the English following at about three or four lengths, but before they had gone half a mile, the stirrup-leather of Sharper broke, and he ran away with his rider, followed by Mina, and they went more than a mile, and up a steep hill, before they could be held in.

Half the distance was run in an hour and four minutes. Both the English horses were then fresh, and one of the Cossacks. On their return, Mina fell lame, and was taken away. The Cossack horse, likewise, began to flag, when the accompanying Russians began to drag him on by the bridle, throwing away the saddle, and putting a mere child on his back. Sharper, likewise, evidently shewed the effects of the pace at which he had gone when running away, and was much distressed. The Cossacks then had recourse to foul play, and actually *carried on* their horse; some dragging him on by a rope, and the bridle at his head; and others pulling him on by the tail, and riding alongside of his quarters to support him, and relieving each other at this fatiguing work. Sharper did the whole distance in two hours and forty-eight minutes, and the Cossack horse was warped in, eight minutes after him. At starting, the English horses carried full three stone more than the Cossacks; and during the latter half of the race, a mere child had ridden the Cossack.

THE TURKISH HORSE.

The Turkish horses are descended principally from the Arab, crossed by the Persian and certain other bloods. The body, however, is even longer than the Arabian's, and the crupper more elevated. They have contributed materially to the improvement of the English breed. The Byerley and the Helmsley Turk are names familiar to every one conversant with horses, and connected with our best blood.

The learned and benevolent Busbequius, who was ambassador at Constantinople in the seventeenth century, gives the following account of the Turkish horses. Our grooms, and their masters too, may learn a lesson of wisdom and humanity from his words.

" There is no creature so gentle as a Turkish horse, nor more respectful to his master, or the groom that dresses him. The reason is, because they treat their horses with great lenity. I myself saw, when I was in Pontus, passing through a part of Bithinia called Axilos, towards Cappadocia, how indulgent the countrymen were to young colts, and how kindly they used them soon after they were foaled. They would stroke them, bring them into their houses, and almost to their tables, and use them even like children. They hung something like a jewel about their necks, and a garter, which was full of amulets against poison, which they are most afraid of. The grooms that dress them are as indulgent as their masters; they frequently sleek them down with their hands, and never use a cudgel to bang their sides, but in cases of necessity. This makes their horses great lovers of mankind; and they are so far from kicking, wincing, or growing untractable by this gentle usage, that you will hardly find a masterless horse amongst them.

" But, alas! our Christian grooms' horses go on at another rate. They never think them rightly curried till they thunder at them with their voices, and let their clubs or horse-whips, as it were, dwell on their sides. This makes some horses even tremble when their keepers come into their stable; so that they hate and fear them too. But the Turks love to have their horses so gentle, that at the word of command they may fall on their knees, and in this position receive their riders.

" They will take up a staff or club upon the road with their teeth, which their rider has let fall, and hold it up to him again; and when they are perfect in this lesson, then, for credit, they have rings of silver hung on their nostrils as a badge of honour and good discipline. I saw some horses when their master was fallen from the saddle stand stock still without wagging a foot till he got up again. Another time I saw a groom standing at a distance in the midst of a whole ring of horses, and, at the word of command, they would either go round or stand still. Once I saw some horses when their master was at dinner with me in an upper room prick up their ears to hear his voice, and when they did so they neighed for joy."

THE GERMAN HORSE.

The German horses are generally large, heavy, and slow. The Hungarian may be an exception, being lighter, speedier, and giving greater proof of Eastern blood*. Every part of the continent, however, following the example of England, has been diligently engaged in the improvement of its breed, and the German and Prussian horses are now better proportioned, and have considerable endurance, but are still deficient in speed. The Prussian, German, and the greater part of the French cavalry are procured from Holstein. They are of a dark, glossy, bay-colour, with small heads, large nostrils, and full dark eyes, the fire and clearness of which seem to denote the inward spirit of the animal. They are beautiful, active, and strong.

THE SWEDISH, FINLAND, AND NORWEGIAN HORSE.

Of the *Swedish* horses, Clarke, in his " Scandinavia," says, that they are small but beautiful, and remarkable for their speed and spirit. Those of Finland he describes as yet smaller, not more than twelve hands high, beautifully formed, and very fleet. The peasants take them from the forests when they are wanted for travellers. Although apparently wild, they are under perfect control, and they trot along with ease at the rate of twelve miles an hour."

The following story is told of one of the *Norwegian* horses. His master had been dining at a neighbouring town, and, when it was time to return, had exceeded so much, that he could not keep a firm seat in his saddle. The horse regulated himself, as well as he could, according to the unsettled motion of his rider, but, happening to make a false step, the peasant was thrown, and hung with one foot entangled in the stirrup. The horse immediately stopped, and twisting his body in various directions, endeavoured to extricate his master, but in vain. The man was severely hurt, and almost helpless; but the shock had brought him to his senses. The horse looked at him as he lay on the ground, and, stooping, laid hold of the brim of his hat, and raised his head a little; but the hat coming off, he fell again. The animal then laid hold of the collar of his coat, and raised him by it so far from the ground, that he was enabled to draw his foot out of the stirrup. After resting awhile he regained the saddle, and reached his home. Grateful to his preserver, the man did, what every good feeling bid him,—he cherished the animal until it died of old age.

Many an English farmer owes a considerable debt of gratitude to his intelligent and faithful servant, who has taken care of him when he was unable to take care of himself, and, possibly, has preserved his life. Let him repay the debt by kinder usage.

THE ICELAND HORSE.

There are numerous troops of horses in this cold and inhospitable country, descended, according to Mr. Anderson, from the Norwegian horse, but, according to Mr. Horrebow, being of Scottish origin. They are very small, strong, and swift. There are thousands of them in the mountains which never enter a stable, but instinct or habit has taught them to scrape away the snow, or break the ice, in search of their scanty food. A few are usually kept in the stable, but when the peasant wants more he catches as many as he needs, and shoes them himself, and that sometimes with a sheep's horn*.

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* M. de Buffon strangely affirms, that the Hussars and Hungarians slit the nostrils of their horses with a view to increase their wind, and to prevent their neighing; and that Hungarian, Croatian, and Polish horses continue to old age to have the mark in all their fore-teeth.

THE FLEMISH AND DUTCH HORSE.

The *Flemish and Dutch* horses are large, and strongly and beautifully formed. We are indebted to them for some of the best blood of our draught-horses, and we still have frequent recourse to them for keeping up and improving the breed. They will be more particularly described when the cart-horse is spoken of.

THE FRENCH HORSE.

France contains, like England, numerous breeds of horses, and considerable attention has lately been paid to their improvement; but they are far inferior to ours in beauty, fleetness, and strength. The provinces of Auvergne and Poitou produce good ponies and galloways; but the best French horses are bred in Limousin and Normandy. From the former district come excellent saddle-horses and hunters; and from the latter a stronger species, for the road, the cavalry, or the carriage. The Norman horses are now much crossed by our hunters, and occasionally by the thorough-bred; and the English roadster and light draught-horse has not suffered by a mixture with the Norman.

THE SPANISH HORSE.

Spain was early celebrated for her breed of horses. The Andalusian charger and the Spanish jennet are familiar to all readers of romance. The subjugation of so great a portion of the peninsula to the Moorish sway, by introducing so much of the Barbary blood, mainly contributed to the undisputed excellence of the Spanish horse. One breed, long in the limbs, and graceful in all its motions, was the favourite war-horse of the knight; while another race, carrying the esquire, although inferior in elegance, possessed far more strength and endurance. The Spanish horse of the present day is not much unlike the Yorkshire half-bred; perhaps with flatter legs and better feet, but far inferior figure.

THE ITALIAN HORSE.

The Italian horses were once in high repute, particularly the Neapolitans; but like every thing else in those mismanaged countries, they have sadly degenerated. One circumstance has mainly contributed to this falling off in reputation and value, viz. that the breed has been kept up by occasional intermixture, not of Eastern, but of European blood. A few of the Neapolitan horses, from their superior size and stateliness, are well adapted for the carriage.

THE AMERICAN HORSE.

In the extensive territory and varied climate of the United States, several breeds of horses are found.

The *Canadian* is found principally in Canada, and the Northern States. He is supposed to be of French descent, and many of the celebrated American trotters are of this breed. We will speak of some of them when we describe the paces of the horse.

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* Kerguelen's Voyage to the North.

The *Conestoga* horse is found in Pennsylvania, and the middle States—long in the leg and light in the carcase—sometimes rising seventeen hands, used principally for the carriage; but when not too high, and with sufficient substance, useful for hunting and the saddle.

The *English* horse, with a good deal of blood, prevails in Virginia and Kentucky; and is found, to a greater or less degree, in all the States. The Americans have, at different times, imported some of the best English blood. It has been most diligently and purely preserved in the Southern States. The celebrated Shark, the best horse of his day, and equalled by few at any time, was the sire of the best Virginian horses; and Tally-ho, a son of Highflyer, peopled the Jerseys.

In the back-settlements, and in the south-western States, is a horse resembling the wild horse of the Pampas, already described, and evidently of the same origin.

Chapter III.

HISTORY OF THE ENGLISH HORSE.

The earliest record of the horse in Great Britain is contained in the history given by Julius Cæsar of his invasion of our island. The British army was accompanied by numerous war-chariots, drawn by horses. Short scythes were fastened to the ends of the axletrees, sweeping down every thing before them, and carrying terror and devastation into the ranks of their enemies. The conqueror gives a most animated description of the dexterity with which the horses were managed.

What kind of horse the Britons then possessed, it would be useless to inquire; but, from the cumbrous structure of the car, and the fury with which it was driven, and from the badness or nonexistence of the roads, they must have been both active and powerful in an extraordinary degree. Cæsar deemed them so valuable, that he carried many of them to Rome; and the British horses were, for a considerable period afterwards, in great request in various parts of the Roman empire.

Horses must at that time have been exceedingly numerous in Britain, for we are told that when the British king, Cassibellaunus, dismissed the main body of his army, he retained four thousand of his war-chariots for the purpose of harassing the Romans, when they attempted to forage.

The British horse now received its first cross; but whether the bree was thereby improved cannot be ascertained. The Romans having established themselves in Britain, found it necessary to send over a numerous body of cavalry to maintain a chain of posts and check the frequent insurrections of the natives. The Roman horses would breed with those of the country, and, to a greater or less extent, change their character; and from this time, the English horse would consist of a compound of the native and those from Gaul, Italy, Spain, and every province from which the Roman cavalry was supplied. Many centuries afterwards passed by, and we have no record of the character or value, improvement or deterioration, of the animal.

It would appear probable, however, that Athelstan, the natural son of Alfred the Great, and the second in succession to him, paid some attention to the improvement of the horse; for having subdued all the rebellious portions of the Heptarchy, he was congratulated on his success by some of the continental princes, and received from Hugh Capet of France, who solicited his sister in marriage, various presents, doubtless of a nature that would be thought most acceptable to him; and among them several German *running horses.* Hence our breed received another cross, and probably an improvement.

Athelstan seems to have seriously devoted himself to this important object, for he soon afterwards decreed (A. D. 930) that no horses should be sent abroad for sale, or on any account, except as royal presents. This proves his anxiety to preserve the breed, and likewise renders it probable that that breed was beginning to be esteemed by our neighbours. In a document bearing date A. D. 1000 we have an interesting account of the relative value of the horse. If a horse was destroyed, or negligently lost, the compensation to be demanded was thirty shillings; a mare or colt, twenty shillings; a mule or young ass, twelve shillings; an ox, thirty pence; a cow, twenty-four pence; a pig, eightpence; and, it strangely follows, a man, one pound *.

In the laws of Howell the Good, Prince of Wales, and passed a little before this time, there are some curious particulars respecting the value and sale of horses. The value of a foal not fourteen days old is fixed at fourpence; at one year and a day it is estimated at forty-eight pence; and at three years sixty pence. It was then to be tamed with the bridle, and brought up either as a *palfrey* or a *serving horse;* when its value became one hundred and twenty pence; and that of a *wild* or unbroken mare, sixty pence.

Even in those early days, the frauds of dealers were too notorious, and the following singular regulations were established. The buyer was allowed time to ascertain whether the horse were free from three diseases. He had three nights to prove him for the staggers; three months to prove the soundness of his lungs; and one year to ascertain whether he was infectd with glanders. For every blemish discovered after the purchase, one-third of the money was to be returned, except it should be a blemish of the ears or tail.

The practice of letting horses for hire was then known, and then, as now, the services of the poor hack were too brutally exacted. The benevolent Howell disdains not to legislate for the protection of this abused and valuable servant. "Whoever shall borrow a horse, and rub the hair so as to gall the back, shall pay fourpence; if the skin is forced into the flesh, eightpence; if the flesh be forced to the bone, sixteen pence."

One circumstance deserves to be remarked, that in none of the earliest historical records of the Anglo-Saxons or the Welsh, is there any allusion to the use of the horse for the plough. Until a comparatively recent period, oxen alone were used in England, as in other countries, for this purpose; but about this time (the latter part of the tenth century) some innovation on this point was creeping in, and, therefore, a Welsh law forbids the farmer to plough with horses, mares, or cows, but with oxen alone. On one of the pieces of tapestry woven at Bayonne in the time of William the Conqueror, (A. D. 1066) there is the figure of a man driving a horse attached to a harrow. This is the earliest notice we have of the use of the horse in field-labour.

With William the Conqueror came a marked improvement in the British horse. To his superiority in cavalry this prince was chiefly indebted for the victory of Hastings. The favourite charger of William was a Spaniard. His followers, both the barons and the common soldiers, came principally from a country in which agriculture had made more rapid progress than in England. A very considerable portion of the kingdom was divided among these men ; and it cannot be doubted that, however unjust was the usurpation of the Norman, England benefited in its husbandry, and particularly in its horses, by the change of masters. Some of the barons, and particularly Roger de Boulogne, earl of Shrewsbury, introduced the Spanish horse, on their newly-acquired estates. The historians of these times, however, principally monks, knowing nothing about horses, give us very little information on the subject.

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* According to the Anglo-Saxon computation, forty-eight shillings made a pound, equal in silver to about three pounds of our present money, in value to fifteen or sixteen pounds, and five pence made one shilling.

In the reign of Henry I. (A. D. 1121) the first Arabian horse, or, at least, the first on record, was introduced. Alexander I., king of Scotland, presented to the church of St. Andrew's, an Arabian horse, with costly furniture, Turkish armour, many valuable trinkets, and a considerable estate.

Forty years afterwards, in the reign of Henry II., Smithfield was celebrated as a horse-market. Fitz-Stephen, who lived at that time, gives the following animated account of the manner in which the *hackneys* and *charging-steeds* were tried there, by racing against one another. " When a race is to be run by this sort of horses, and perhaps by others, which also in their kind are strong and fleet, a shout is immediately raised, and the common horses are ordered to withdraw out of the way. Three jockeys, or sometimes only two, as the match is made, prepare themselves for the contest. The horses on their part are not without emulation ; they tremble and are impatient, and are continually in motion. At last, the signal once given, they start, devour the course, and hurry along with unremitting swiftness. The jockeys inspired with the thought of applause, and the hope of victory, clap spurs to their willing horses, brandish their whips, and cheer them with their cries." This description reminds us of the more lengthened races of the present day, and proves the blood of the English horse, even before the Eastern breed was tried.

Close on this followed the Crusades. The champions of the Cross certainly had it in their power to enrich their native country with some of the choicest specimens of Eastern horses, but they were completely under the influence of superstition and fanaticism, and common sense and usefulness were forgotten.

An old metrical romance, however, records the excellence of two horses belonging to Richard Cœur de Lion, which he purchased at Cyprus, and were therefore, probably, of Eastern origin.

Yn this worlde they hadde no pere*,
Dromedary nor destrere †,
Stede, Rabyte‡, ne Cammele,
Goeth none so swifte, without fayle:
For a thousand pownd of golde,
Ne should the one be solde.

The war-steed was defended by mail or plate, much on the plan of the harness of the knight himself. His head was ornamented with a crest. The head, chest, and flanks, were wholly or partially protected ; and sometimes, he was clad in complete steel, with the arms of his master engraved or embossed on his *bardings*. The bridle of the horse was always as splendid as the circumstances of the knight allowed, and thus a horse was often called Brigliadore, from *briglia d'oro*, a bridle of gold. Bells were a very favourite addition to the equipment of the horse. The old Troubadour, Arnold of Marson, says, that "nothing is so proper to inspire confidence in a knight, and terror in an enemy."

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* Peer, equal. † War horse. ‡ Arabian.

The price of horses at this period was singularly uncertain. In 1185, fifteen breeding mares sold for two pounds twelve shillings and sixpence. They were purchased by the monarch, and distributed among his tenants, and, in order to get something by the bargain, he charged them the great sum of four shillings each. Twenty years afterwards, ten capital horses brought no less than twenty pounds each; and, twelve years later, a pair of horses were imported from Lombardy, for which the extravagant price of thirty-eight pounds thirteen shillings and fourpence was given. The usual price of good handsome horses was ten pounds, and the hire of a car or cart, with two horses, was tenpence a-day.

To King John, hateful as he was in all other respects, we are yet much indebted for the attention which he paid to agriculture generally, and particularly to improving the breed of horses. He imported one hundred chosen stallions of the Flanders kind, and thus mainly contributed to prepare our noble species of draught-horses, as unrivalled as the horses of the turf.

John accumulated a very numerous and valuable stud. He was eager to possess himself of every horse of more than usual power; and, at all times, gladly received, from the tenants of the crown, horses of a superior quality, instead of money, for the renewal of grants, or the payment of forfeitures belonging to the crown. It was his pride to render his cavalry, and the horses for the tournament and for pleasure, as perfect as possible. It could not be expected that so haughty a tyrant would concern himself much with the inferior kinds; yet while the superior was becoming rapidly more valuable, the others would, in an indirect manner, partake of the improvement.

One hundred years afterwards, Edward II. purchased thirty Lombardy *war-horses*, and twelve heavy draught-horses. Lombardy, Italy, and Spain were the countries whence the greater part of Europe was then supplied with the most valuable cavalry or parade horses. Horses for agricultural purposes were chiefly procured from Flanders.

Edward III. devoted one thousand marks to the purchase of fifty Spanish horses; and of such importance did he conceive this addition to the English, or rather mingled blood, then existing, that formal application was made to the kings of France and Spain to grant safe conduct to the troop. When they had safely arrived at the royal stud, it was computed that they had cost the monarch no less than thirteen pounds six shillings and eightpence per horse, equal in value to one hundred and sixty pounds of our present money.

This monarch had many *running-horses*. The precise meaning of the term is not, however, clear. It might be light and speedy horses in opposition to the war-horse, or those that were literally used for the purpose of racing. The average price of these running-horses was twenty marks, or three pounds six shillings and eightpence. Edward was devoted to the sports of the turf or the field, or he began to see the propriety of crossing our stately and heavy breed with those of a lighter structure and greater speed.

There was, however, one impediment to this, which was not for a very long period removed. The soldier was cased in heavy armour. The knight, with all his accoutrements, often rode more than twenty-five stone. No little bulk and strength were required in the animal destined to carry this back-breaking weight. When the musket was substituted for the cross-bow and battle-axe, and this iron defence, cumbrous to the wearer and destructive to the horse, was useless, and laid aside, the improvement of the British horse in reality commenced.

While Edward was thus eager to avail himself of foreign blood, with the too frequent selfishness of the sportsman, he would let no neighbour share in the advantage. The exportation of horses was forbidden under very heavy penalties. One case in which he relaxed from his severity is mentioned, when he permitted a German merchant to re-export some Flanders horses which he had brought on speculation; but he was strictly forbidden to send them to Scotland. Nay, so jealous were these sister-kingdoms of each other's prosperity, that so late as the time of Elizabeth, it was felony to export horses from England to Scotland.

The English horse was advancing, although slowly, to an equality with, or even superiority over those of neighbouring countries. His value began to be more generally and highly estimated, and his price rapidly increased—so much so, that breeders and the dealers, then, as now, skilful in imposing on the inexperienced, obtained from many of our young grandees enormous prices for them. This evil magnified to such an extent, that Richard II (1386) interfered to regulate and determine the price. The proclamation which he issued is interesting not only as proving the increased value of the horse, but shewing what were, four hundred and fifty years ago, and what are, still, the chief breeding districts. It was ordered to be published in the counties of Lincoln and Cambridge, and the East and North Ridings of Yorkshire; and the price of the horse was restricted to that which had been determined by former sovereigns. A more enlightened policy has at length banished all such absurd interferences with agriculture and commerce.

We can now collect but little of the history of the horse until the reign of Henry VII., at the close of the fifteenth century. He continued to prohibit the exportation of stallions, but allowed that of mares when more than two years old, and under the value of six shillings and eightpence. This regulation was, however, easily evaded, for if a mare could be found worth more than six shillings and eightpence, she might be freely exported on the payment of that sum.

Henry VIII., a tyrannical and cruel prince, but fond of shew and splendour, was very anxious to produce a valuable breed of horses; and the means which he adopted were both perfectly in unison with his arbitrary disposition, and very little calculated to effect his object. He affixed a certain standard, below which no horse should be kept. The lowest height for the stallion was fifteen hands, and for the mare thirteen hands; and even before they had arrived at their full growth, no stallion above two years old, and under fourteen hands and a half, was permitted to run on any forest, moor, or common, where there were mares. At "Michaelmas-tide" the neighbouring magistrates were ordered to "drive" all forests and commons, and not only destroy such stallions, but all "unlikely tits," whether mares or geldings, or foals, which they might deem not calculated to produce a valuable breed. He likewise ordained, that in every deer-park a certain number of mares, in proportion to its size, and each at least thirteen hands high, should be kept; and that all his prelates and nobles, and "all those whose wives wore velvet bonnets," should keep stallions for the saddle at least fifteen hands high. These ordinances perished with the tyrant by whom they were promulgated.

The reign of Henry VIII. produced the earliest English treatise on agriculture, and the management of horses and cattle. It was written by Sir A. Fitzherbert, Judge of the Common Pleas, and contains much useful information. It is entitled, "Boke of Husbandry;" and, being now exceedingly rare, an extract from it may not be unacceptable. It would seem that the mare had been but lately employed in husbandry, for he says, "A husbande may not be without horses and mares, and specially if he goe with a horse-ploughe he must have both, his horses to draive; his mares to brynge colts to upholde his stocke, and yet at many times they may draive well if they be well handled." The learned judge shared the common fate of those who have to do with the horse. "Thou grasyer, that mayst fortune to be of myne opinion or condytion to love horses, and young coltes and foles to go among thy cattle, take hede that thou be not beguiled as I have been a hundred tymes and more. And first thou shalt knowe that a good horse has 54 properties, that is to say, 2 of a man, 2 of a badger, 4 of a lion, 9 of an oxe, 9 of a hare, 9 of a foxe, 9 of an asse, and 10 of a woman*."

The tyrannical edicts of Henry VIII. had the effect which common sense would have anticipated,—the breed of horses was not materially improved, and their numbers were sadly diminished. When the bigot, Philip of Spain, threatened England, in the reign of Elizabeth, with his Invincible Armada, that princess could muster in her whole kingdom only three thousand cavalry to oppose him; and Blundeville, who wrote at this time a very pleasant and excellent book on the art of riding, speaks contemptuously of the qualities of these horses. The secret of improving the breed had not been then discovered; it had been attempted by arbitrary power; and it had extended only to those crosses from which little good could have been expected: or, rather, it had more reference to the actual situation of the country, and the heavy carriages, and the bad roads, and the tedious travelling which then prevailed, than to the wonderful change in these which a few centuries were destined to effect.

Blundeville describes the majority of our horses as consisting of strong, sturdy beasts, fit only for slow draught, and the few of a lighter structure being weak and without bottom. There were, however, some exceptions; for he relates a case of one of these lighter horses travelling eighty miles in a day—a task which in later times has been too often and cruelly exacted from our half-bred nags.

An account has been given of the racing trial of the horses in Smithfield market. Regular races were now established in various parts of England. Meetings of this kind were first held at Chester and Stamford; but there was no acknowledged system as now; and no breed of racing horses. Hunters and hackneys mingled together, and no description of horse was excluded.

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* Later writers have pirated from Sir A., but have not improved upon him. The following description of the horse is well known. "A good horse should have three qualities of a woman,—a broad breast, round hips, and a long mane;—three of a lion,—countenance, courage, and fire;—three of a bullock,—the eye, the nostril, and joynts,—three of a sheep,—the nose, gentleness, and patience;—three of a mule,—strength, constancy, and foot;—three of a deer,—head, legs, and short hair;—three of a wolf;—throat, neck, and hearing;—three of a fox,—ear, tail, and trot;—three of a serpent,—memory, sight, and turning;—and three of a hare or cat,—running, walking, and suppleness."

There was at first no course marked out for the race, but the contest generally consisted in the running of *train-scent* across the country, and sometimes the most difficult and dangerous part of the country was selected for the exhibition. Occasionally our present steeple chase was adopted with all its dangers, and more than its present barbarity; for persons were appointed cruelly to flog along the jaded and exhausted horses.

It should, however, be acknowledged that the races of that period were not disgraced by the system of gambling and fraud which seems to have become almost inseparable from the amusements of the turf. The prize was usually a wooden bell adorned with flowers. This was afterwards exchanged for a silver bell, and " given to him who should run the best and farthest on horseback on Shrove Tuesday." Hence the common phrase of " bearing away the bell."

Horse-racing became gradually more cultivated; but it was not until the last year of the reign of James I., that rules were promulgated and generally subscribed to for their regulation. That prince was fond of field sports. He had encouraged, if he did not establish, horse-racing in Scotland, and he brought with him to England his predilection for it; but his races were more often matches against time, or trials of speed and bottom, for absurdly and cruelly long distances. His favourite courses were at Croydon and on Enfield Chase.

Although the Turkish and Barbary horses had been freely used to produce with the English mare the breed which was best suited to this exercise, little improvement had been effected. James, with great judgment, determined to try the Arab breed. Probably, he had not forgotten the story of the Arabian, which had been presented to one of his Scottish churches, five centuries before. He purchased, from a merchant named Markham, a celebrated Arabian horse, for which he gave the extravagant sum of five hundred pounds. Kings, however, like their subjects, are often thwarted and governed by their servants, and the Duke of Newcastle took a dislike to this foreign animal. He wrote a book, and a very good one, on horsemanship, and described this Arabian as a little bony horse, of ordinary shape, setting him down as good for nothing, because, after being regularly trained, he could not race. The opinion of the Duke, probably altogether erroneous, had, for nearly a century, great weight; and the Arabian horse lost its reputation among the English turf-breeders.

A South-Eastern horse was afterwards brought into England, and purchased by James, of Mr. Place, who was afterwards stud-master, or groom to Oliver Cromwell. This beautiful animal was called the White Turk, and his name and that of his keeper will long be remembered. Shortly afterwards appeared the Helmsley Turk, introduced by Villiers, the first duke of Buckingham. He was followed by Fairfax's Morocco Barb. These horses speedily effected a considerable change in the character of our breed, so that Lord Harleigh, one of the old school, complained that the great horse was fast disappearing, and that horses were now bred light and fine for the sake of speed only.

Charles I. ardently pursued this favourite object of English gentlemen, and, a little before his rupture with the parliament, established races in Hyde Park, and at Newmarket. The civil wars somewhat suspended the improvement of the breed; yet the advantage which was derived by both parties from a light and active cavalry, sufficiently proved the importance of the change which had been effected; and Cromwell perceiving, with his wonted sagacity, how much these pursuits were connected with the prosperity of the country, had his stud of race-horses.

At the Restoration a new impulse was given to the cultivation of the horse by the inclination of the court to patronize gaiety and dissipation. The races at Newmarket were restored, and as an additional spur to emulation, royal plates were now given at each of the principal courses. Charles II. sent his master of the horse to the Levant, to purchase brood mares and stallions. These were principally Barbs and Turks.

From that period to the middle of the last century, the system of improvement was zealously pursued: every variety of Eastern blood was occasionally engrafted on ours, and the superiority of the engrafted, above the very best of the original stock, began to be evident.

Man is rarely satisfied with any degree of perfection in the object on which he has set his heart. The sportsman had now beauty of form, and speed and stoutness, scarcely an approach to which had been observed in the original breed. Still some imagined that this speed and stoutness might possibly be increased; and Mr. Darley, in the latter part of the reign of Queen Anne, had recourse to the discarded and despised Arabian. He had much prejudice to contend with, and it was some time before the Darley Arabian attracted notice. At length the value of his produce began to be recognised, and to him we are greatly indebted for a breed of horses of unequalled beauty, speed, and strength.

This last improvement now furnishes all that can be desired: nor is this true only of the thorough-bred or turf-horse; it is, to a very material degree, the case with every description of horse. By a judicious admixture and proportion of blood, we have rendered our hunters, our hackneys, our coach, nay even our cart horses, much stronger, more active, and more enduring, than they were before the introduction of the race-horse.

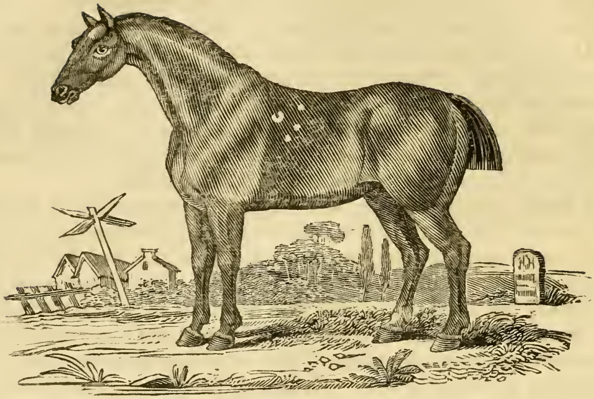
Chapter IV.

THE DIFFERENT BREEDS OF ENGLISH HORSES.

The reader is now prepared for the history and distinguishing character of the various breeds of English horses. If we were composing a treatise on the horse adapted for general readers, we should commence with the racer, or thorough-bred horse, which, if it be not considered as the parent of every other breed, yet enters into, and adds, or often gives, the only value to it. Remembering, however, the title of our work, we will begin with those which are occasionally or chiefly employed for agricultural purposes. First stands the *Roadster*, or *Hackney*, whether used by the farmer to ride over his grounds, or for the longer journeys of business or pleasure.

The roadster varies much in different districts, and according to the whim or caprice of the rider. We have presented our readers with a portrait of the old English hackney, now, fortunately, little known, yet the origin of our best saddle-horses, whether for the road or the field. The modern horseman will find some fault with him. We give him as he was, and shall proceed to describe a much superior animal.

THE ROAD HORSE.



The Road Horse! more difficult to meet with in perfection than even the hunter or the courser. There are many reasons for this. The price of the hackney, or the horse of all-work, is so low, that he who has a good one will not part with him; and it is by mere accident that he can be obtained. There are also several faults that can be overlooked in the hunter, but which the road-horse must not have. The hunter may start, may be awkward in his walk, or even his trot; he may have thrushes or corns; but if he can go a good slapping pace, and has wind and bottom, we can put up with him, or prize him: but the hackney, if he be worth having, must have good fore legs, and good hinder ones too; he must be sound on his feet; even-tempered; no starter; quiet in whatever situation he may be placed; not heavy in hand; and never disposed to say his prayers.

If there be one thing more than any other, in which the possessor, and, in his own estimation at least, the tolerable judge of the horse, is in error, it is the *action* of the road-horse: "Let him lift his legs well," it is said, "and he will never come down."

In proportion, however, as he lifts his legs well, will be the force with which he puts them down again; the jar and concussion to the rider; and the battering and wear and tear of the feet. A horse with too great "knee action" will not always be speedy; he will rarely be pleasant to ride, and he will not, in the long run, be safer than others. The careless *daisy-cutter*, however pleasant on the turf, should indeed be avoided, unless the neck of the rider be previously insured; yet it is a rule, not often understood, and sometimes disputed, but which experience will fully confirm,—that the safety of the horse depends a great deal more on the manner in which he puts his feet down, than on that in which he lifts them up:—more on the foot being placed at once flat on the ground, or perhaps the heel coming first in contact with it, than on the highest and most splendid action.

When the toe first touches the ground, it may be easily supposed that the horse will occasionally topple over. An unexpected obstacle will throw the centre of gravity forward, and down he will come. If the toe dig into the ground before the foot is firmly placed, a little thing will cause a trip and a fall.

Let the farmer who has a stumbler look at the shoes of his horse. In what part is the wear and tear?—The toe of the shoe will become round, or even be altogether gone, before the heel is scarcely touched.

For pleasant riding, and for safety also, a hackney *should not carry his legs too high.* His going a little *too* near to the ground is not always to be considered as an insuperable objection. The question is, does he dig his toe into the ground?

Mount him, and put him to the test. Take up his feet and examine them. If the shoe, after having been on a week, or a fortnight, is not unnecessarily worn at the toe, and you feel him put his foot flat on the ground, do not scruple to buy him, nay, esteem him a "choice-gifted hackney," although he may not have the lofty action which some have erroneously thought so necessary.

Every horse, however, is liable to fall, and therefore comes the golden rule of riding, "*never trust to your horse*,"—always feel his mouth lightly. He does wrong who constantly pulls might and main; he will soon spoil his horse's mouth, and render the arm-aching work always necessary. He does worse who carelessly throws the reins on the neck of the horse. *Always feel the mouth lightly;* you will thus be able to give the animal assistance *immediately*, before he is too much off his centre, and when a little check will save him. By this constant gentle *feeling* you will likewise induce him to carry his head well, than which few things are more conducive to the beautiful, safe, and easy going of the horse.

The road-horse may, and should, like the hunter, possess different degrees of blood, according to the nature of the country, and the work required of him. When approaching to thoroughbred, he may be a splendid animal, but he will be scarcely fitted for his duty. His legs will be too slender; his feet too small; his stride too long; and he will rarely be able to trot. Three parts, or half, and for the horse of all-work, even less than that, will make a good and useful animal.

The hackney should be a hunter in miniature, with these exceptions. His height should rarely exceed fifteen hands and an inch. He will be sufficiently strong and more pleasant for general work below that standard. —He should be of a more compact form than the hunter:—more bulk according to his height, for he has not merely to stand an occasional although severe burst, but a great deal of every-day work.

It is of essential consequence that the bones beneath the knee should be deep and flat, and the tendon not *tied in.*

The pastern should be short, and although oblique or slanting, yet far less so than that of the race-horse, and considerably less than that of the hunter. There should be obliquity enough to give pleasant action, but not enough to render the horse incapable of the wear and tear of constant, and sometimes hard work.

The foot is a matter of the greatest consequence in a hackney. It should be of a size corresponding with the bulk of the animal, neither too hollow, nor too flat; open at the heels; and free from corns and thrushes.

The fore legs should be perfectly straight. There needs not a moment's consideration to be assured that a horse with his knees bent will, from a slight cause, and especially if he be overweighted, come down.

The back should be straight and short, yet sufficiently long to leave comfortable room for the saddle between the shoulders and the *huck* without pressing on either. Some persons prefer a hollow-backed horse. It is generally an easy one to go. It will canter well with a lady; but it will not carry a heavy weight, or stand much hard work.

The road-horse should be high in the forehand; round in the barrel; and deep in the chest: the saddle will not then press too forward, but the girths will remain, *without crupper*, firmly fixed in their proper place.

A hackney is far more valuable for the pleasantness of his paces, and his safety, good temper, and endurance, than for his speed. We rarely want to go more than eight or ten miles in an hour; and, on a journey, not more than six or seven. The fast horses, and especially the fast trotters, are not often easy in their paces, and although they may perform very extraordinary feats, are disabled and worthless when the slower horse is in his prime.

Most of our readers probably are horsemen. Their memories will supply them with many an instance of intelligence and fidelity in the horse, and particularly in the hackney—the every-day companion of man. A friend of ours rode thirty miles from home on a young horse which he had bred, and which had never before been in that part of the country. The road was difficult to find, but by dint of inquiry he at length reached the place he sought. Two years passed over, and he had again occasion to take the same journey. No one rode this horse but himself, and he was perfectly assured that the animal had not since been in that direction. Three or four miles before he reached his journey's end he was benighted.—He had to traverse moor and common, and he could scarcely see his horse's head.—The rain began to pelt. " Well," thought he, " here I am, far from any house, and know not, nor can I see an inch of my road. I have heard much of the memory of the horse,—it is my only hope now,—so my fine fellow," throwing the reins on his horse's neck, " go on." In half an hour he was safe at his friend's gate.

The following anecdote, given on the authority of Professor Kruger of Halle, proves both the sagacity and fidelity of the horse.—A friend of his, riding home through a wood in a dark night, struck his head against the branch of a tree, and fell from his horse stunned. The steed immediately returned to the house which they had lately left, and which was now closed, and the family in bed, and pawed at the door until some one rose and opened it. He turned about, and the man wondering at the affair, followed him: the faithful and intelligent animal led him to the place where his master lay senseless on the ground.

Cunningham, in his valuable account of New South Wales, vol. i. p. 298, says, " A friend of mine in the habit of riding a good deal, found that whenever he approached a gully, his sagacious horse invariably opposed his wishes to cross at the particular spot he had been accustomed to, always endeavouring to lead off to another part of the gully, where no passage was known to exist by his rider. Resolving to see whither the cunning rogue would go, he gave him the rein, and soon found himself carried over the gully by a route he had never before followed. Still, however, thinking that the former way was the nearest, he was curious enough to have both measured, when he found the horse's judgment correct; that way being the nearest by several hundred yards."

Of the paces of the hackney, and of horses generally, and the principle of the walk, the trot, the canter, and the gallop, we shall be better able to speak, when the structure of the horse, varying in different breeds, has been explained.

The points of shape most essential to be attended to in the choice of a hackney, are—the shoulders and the fore legs and feet: because a horse whose shoulders are properly formed and placed is not liable to fall down; and because his soundness depends chiefly upon his legs and feet. The shoulders should not be too upright, but should slope backwards from the shoulder point to the withers. It is desirable, if the horse is intended to carry a man of much weight, that the shoulders should be rather thick than thin; but it is essential that they should not be too large at the points. A horse whose shoulders are good, stands, when in a natural position, with his fore legs in a line perpendicular to the ground; it is therefore very desirable that the purchaser should see him in the stable, and before he has been moved, for he will then find him in his natural position, in which it may be difficult to place him after he has been once disturbed. Another mode of ascertaining whether the shoulders are properly placed is, by allowing the horse to walk past you, and to observe whether he places his fore foot more forward than the shoulder point when he puts it on the ground. A horse whose shoulders are properly formed will always do so; one whose shoulders are upright, cannot. The fore quarters of a horse intended to be used as a hackney constitute an essential point: his carcase should be round, and his ribs deep. A horse's fore leg, of the proper form, should be flat, and as large under the knee as it is just above the fetlock. The pastern should be so joined to the leg at the fetlock, that the horse should neither turn his feet out or in; but it is less objectionable that a horse should turn his feet a little outwards, provided it is not so much as to make him hit his fetlocks, than that he should turn them inwards.

THE FARMER'S HORSE.

The Farmer's Horse is an animal of *all-work;* to be ridden occasionally to market or for pleasure, but to be principally employed for draught. He should be higher than the road-horse: about fifteen hands and two inches may be taken as the best standard. A horse with a shoulder thicker, lower, and less slanting than would be chosen in a hackney, will better suit the collar; and collar-work will be chiefly required of him. A stout compact horse should be selected, yet not a heavy cloddy one. Some blood will be desirable, but the half-bred horse will generally best suit the farmer's purpose. He should have weight enough to throw into the collar, and sufficient activity to get over the ground.

Farmers are now beginning to be aware of the superiority of the moderate-sized, strong, active horse over the bulkier, but slower animal of former days. It is not only in harvest, and when a frosty morning must be seized to cart manure, that this is perceived, but, in the every-day work of the farm, the saving of time, and the saving of provender too, will be very considerable in the course of a year.

It has often been said, that a horse used much for draught is neither pleasant nor safe for the saddle. The little farmer does not want a shewy, complete hackney. He will be content if he is tolerably well carried; and (if he has taken a little care in the choice of his horse; has selected one with sound feet, shoulders not too thick, and legs not too much under him; and, if he keeps him in good condition, and does not scandalously overweight him,) the five days carting or harrow-work will not, to any material degree, unfit him for the saddle; especially if the rider bear in mind what we have termed the golden rule of horsemanship, always *a little to feel* the mouth of the animal he is upon.

A farmer, and, more particularly, a small farmer, will prefer a mare to a gelding, both for riding and driving. She will not cost him so much at first; and he will get a great deal more work out of her. There can be no doubt that, taking bulk for bulk, a mare is stronger and more lasting than a gelding; and, in addition to this, the farmer has her to breed from. This and the profit which is attached to it is well known in the breeding counties; but why the breeding of horses for sale should be almost exclusively confined to a few northern districts it is not easy to explain. Wherever there are good horses, with convenience for rearing the colts, the farmer may start as a breeder with a good chance of success.

If he has a few useful cart-mares, and crosses them with a well-knit, half-bred horse, he will certainly have colts useful for every purpose of agriculture, and some of them sufficiently light for the van, post-chaise, or coach. If he has a superior mare, one of the old Cleveland breed, and puts her to a bony, three-fourths-bred horse, or, if he can find one stout and compact enough, a seven-eighths, or a thorough-bred one, he will have a fair chance to rear a colt that will amply repay him as a hunter or carriage-horse.

The mare needs not be idle while she is breeding. She may be worked moderately almost to the period of her foaling, and with benefit rather than otherwise: nor is there occasion that much of her time should be lost even while she is suckling. If she is put to horse in June, the foaling time will fall, and the loss of labour will occur, in the most leisure time of the year.

There are two rocks on which the farmer often strikes: he pays little attention to the kind of mare, and less to the proper nourishment of the foal. It may be laid down as a maxim in breeding, however general may be the prejudice against it, that the value of the foal depends a great deal more on the dam than on the sire. The Arabs are convinced of this, for no price will buy from them a likely mare of the highest blood; and they trace back the pedigree of their horses, not through the sire, but the dam. The Greek sporting-men held the same opinion, long before the Arab horse was known. "What chance of winning have I?" inquired a youth whose horse was about to start on the Olympic course. "Ask the *dam* of your horse" was the reply, founded on experience*.

The farmer, however, too frequently thinks that any mare will do to breed from; and, if he can find a great prancing stallion, with a high-sounding name, and loaded with fat, he reckons on having a valuable colt: and should he fail, he attributes the fault to the horse, and not to his own want of judgment. Far more depends on the mare than is dreamt of in his philosophy.

If he has an undersized, or a blemished, or unsound mare, let him continue to use her on his farm: she probably did not cost him much, and she will beat any gelding; but let him not think of breeding from her. A roomy mare, with some blood in her, and with most of the good points, will alone answer his purpose. She may bear about her the marks of honest work (the fewer of these, however, the better), but she must not have any disease. There is scarcely a malady to which the horse is subject that is not hereditary. Contracted feet, curb, spavin, roaring, thick wind, blindness, notoriously descend from the sire or dam to the foal. Mr. Roberts, in that useful publication, 'The Veterinarian,' says, " Last summer I was asked my opinion of a horse. I approved of his formation with the exception of the hocks, where there happened to be two curbs. I was then told his sister was in the same stable: she also had two curbs. Knowing the sire to be free from these defects, I inquired about the dam: she also had two confirmed curbs. She was at this time running with a foal of hers, two years old, by another horse, and he also had two curbs."

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* Bishop Hall, who wrote in the time of Elizabeth, intimates that such was the opinion of horsemen at that period. He asks, in one of his satires (Lib. iv.)

> "——— dost thou prize
> Thy brute beasts' worth by their dams' qualities?
> Say'st thou this colt shall prove a swift-pac'd steed
> Onely because a Jennet did him breed?
> Or say'st thou this same horse shall win the prize,
> Because his dam was swiftest Tranchefice?"

The foal should be well taken care of for the first two years. It is bad policy to stint, or half-starve, the growing colt.

The colt, whether intended for a hunter or carriage-horse, may be earlier handled, but should not be broken-in until three years old; and then the very best breaking-in for the carriage-horse is to make him earn a little of his living. Let him be put to harrow or light plough. Going over the rough ground will teach him to lift his feet well, and give him that high and shewy action, excusable in a carriage-horse, but excusable in no other. In the succeeding winter he will be perfectly ready for the town or country market.

THE COACH-HORSE *.

This animal has fully shared in the progress of improvement, and is as different from what he was fifty years ago as it is possible to conceive.

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* Wheel carriages, bearing any resemblance to *chariots,* first came into use in the reign of Richard II. about the year 1381; they were called *whirlicotes,* and were little better than litters or *cotes* (*cots*) placed on wheels. We are told by Master John Stowe, that "Richard II., being threatened by the rebels of Kent, rode from the Tower of London to the Miles End, and with him his mother, because she was sick and weak, in a whirlicote;" and this is described as an ugly vehicle of four boards put together in a clumsy manner.

In the following year he married Anne of Luxembourg, who introduced the riding upon side-saddles; and so " was the riding in those whirlicotes forsaken, except at coronations and such like spectacles."

Coaches were not used until the time of Elizabeth, when we are told (Stowe's Survey of London and Westminster, book i.) " divers great ladies made them coaches, and rode in them up and down the countries to the great admiration of all the beholders." The fashion soon spread, and he adds, what is often too true in the present day, " the world runs on wheels with many whose parents were glad to go on foot."

These coaches were heavy and unwieldy, and probably bore some rough resemblance to the state coaches now used occasionally in court processions.

The rate of travelling was as slow as the clumsiness of the horses and vehicle would naturally indicate. King George II. died early on Saturday morning, Oct. 21, 1760: the Duke of Devonshire, who was lord chamberlain, arrived in town from Chatsworth in three days; but a fourth and a fifth day passing over, and the lord steward, the Duke of Rutland, not making his appearance, although he had not so far to travel by more than thirty miles, Mr. Speaker Onslow made this apology for him, that " the Duke of Devonshire travelled at a prodigious rate, not less than *fifty miles a day!*"

To travel in the stage-coach from London to Epsom, sixteen miles, then took nearly the whole day, and the passengers dined on the road. The coach from Edinburgh to London started once a month, and occupied sixteen or eighteen days on the journey. A person may now start from Edinburgh on Saturday evening, have two spare days in London, and be back again at the Scotch metropolis to breakfast on the next Saturday. In-

The clumsy-barrelled, cloddy-shouldered, round-legged, black family horse, neither a coach nor a dray-horse, but something between both, as fat as an ox, and, with all his pride and prancing at first starting, not equal to more than six miles an hour, and knocking-up with one hard day's work, is no more seen; and we have, instead of him, an animal as tall, deep-chested, rising in the withers, slanting in the shoulders, flat in the legs, with even more strength, and with treble the speed.

There is a great deal of deception, however, even in the best of these improved coach-horses. They prance it nobly through the streets; and they have more work in them than the old clumsy, sluggish breed: but they have not the endurance that could be wished,—and a pair of poor post-horses would, at the end of the second day, beat them hollow.

The knee-action, and high lifting of the feet in the carriage-horse is deemed an excellence, because it adds to the grandeur of his appearance; but, as has already been stated, it is necessarily accompanied by much wear and tear of the legs and feet, and this is very soon apparent.

The principal points in the coach-horse are, substance well placed, a deep and well proportioned body, bone under the knee, and sound, open, tough feet.

The origin of the better kind of coach-horse is the Cleveland Bay, confined principally to Yorkshire and Durham, with, perhaps, Lincolnshire on one side, and Northumberland on the other, but difficult to meet with pure in either county. The Cleveland mare is crossed by a three-fourth, or thoroughbred horse of sufficient substance and height, and the produce is the coach-horse most in repute, with his arched crest and high action. From the thoroughbred of sufficient height, but not of so much substance, we obtain the four-in-hand, and superior curricle-horse.

From less height and more substance we have the hunter and better sort of hackney; and, from the half-bred, we derive the machineer, the poster, and the common carriage-horse: indeed, Cleveland, and the Vale of Pickering, in the East Riding of Yorkshire, may be considered as the most decided breeding country in England for coach-horses, hunters, and hacknies. The coach-horse is nothing more than a tall, strong, oversized hunter. The hackney has many of the qualities of the hunter on a small scale.

How far we are carrying supposed improvement too far, and sacrificing strength and usefulness to speed, is a question not difficult to resolve. The rage for rapid travelling is the bane of the post-master, the destruction of the horse, and a disgrace to the English character.

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cluding short stages, one thousand four hundred coaches now set out from London every day; the expense of each of which, with four horses, cannot be less than two shillings and sixpence per mile.

Hackney coaches first appeared in London in 1625, the first year of the reign of Charles I.: sedan-chairs had been introduced by the Duke of Buckingham six years before.

Among the numerous benefits arising from the services of the horse, and the improvement of public roads and carriages, is the speedy and regular correspondence by post. The invention of this useful establishment is ascribed to Cyrus the Great. It was adopted by the Greeks and Romans. It was introduced into France by Louis XI. in 1462, and we first read of it in English history about the year 1550, under Edward VI., when post-houses were established, and horses provided at the rate of one penny per mile. Under Elizabeth a post-master was nominated by government, and under Charles I., in 1634, the system assumed its present form. The charge of postage was then fixed at two pence, if under eighty miles; four pence between eighty and one hundred and forty; and six pence if under two hundred and forty miles; but this charge rapidly increased with the increasing price of horses, and the other expenses of conveyance, and afterwards it was further raised by taxation, like almost everything else.

There is no truth so easily proved, or so painfully felt by the postmaster, at least in his pocket, as that *it is the pace that kills.* A horse at a dead pull, or at the beginning of his pull, is enabled, by the force of his muscles, to throw a certain weight into the collar. If he walk four miles in the hour, some part of that muscular energy must be expended in the act of walking; and, consequently, the power of drawing must be proportionably diminished. If he trot eight miles in the hour, more animal power is expended in the trot, and less remains for the draught; but the draught continues the same, and, to enable him to accomplish his work, he must tax his energies to a degree that is cruel in itself, and that must speedily wear him out.

Let it be supposed—what every horse cannot accomplish—that he shall be able, by fair exertion and without distress, to throw, at a dead pull, a weight into his collar, or exert a force equal to two hundred and sixteen pounds; or, in other words, let him be able to draw a load which requires a force of two hundred and sixteen pounds to move. Let him next walk at the rate of four miles in an hour: what force will he then be able to employ? We have taken away some to assist him in walking, and we have left him only ninety-six pounds, being not half of that which he could exert when he began his pull. He shall quicken his pace to six miles an hour—more energy must be exerted to carry him over this additional ground. How much has he remaining to apply to the weight behind him? Fifty-four pounds only. We will make the six miles an hour ten; for it seems now to be the fashion for the fast coach, and for almost every coach, and every vehicle to attempt this pace. How stands the account with the poor beast? We have left him a power equal to thirty-two pounds only to be employed for the purpose of draught.

The load which a horse can draw is about fifteen times greater than the power exerted, supposing the road to be hard and level, and the carriage to run with little friction; and the horse which at starting can throw into the collar a weight or force equal to two hundred and sixteen pounds, will draw a load of three thousand two hundred. Let him, however, be urged on at the rate of ten miles in the hour—deduct the power used in swiftness of pace from the sum total of that which he possesses, and what remains?—not a sixth part—not that which is equal to a quarter of a ton—or, if it be a stage-coach, the energy exerted in draught by the four horses will not be equal to a ton.

The coach, and its passengers and its luggage, weigh more than this, and the whole is still drawn on, and must be so. Whence comes the power? From the over-strained exertion, the injury, the torture, the destruction of the horse. That which is true of the coach-horse, is equally true of every other. Let each reader apply it to his own animal, and act as humanity and interest dictate.

Many a horse used on our public roads is unable to throw all his natural power or weight into the collar. He is tender-footed—lame; but he is bought at little price, and he is worked on the brutal and abominable principle, that he may be "*whipped sound.*" And so apparently he is. At first he sadly halts; but, urged by the torture of the lash, he acquires a peculiar habit of going. The faulty limb appears to keep pace with the others, but no stress or labour is thrown upon it, and he gradually contrives to make the sound limbs perform among them all the duties of the unsound one; and thus he is barbarously "whipped sound," and cruelty is undeservedly rewarded. After all, however, what has been done? Three legs are made to do that which was almost too hard a task for four. Then they must be most injuriously strained, and soon worn out, and the general power of the animal must be rapidly exhausted, and, at no great distance of time, exhaustion and death release him from his merciless persecutors.

It is said that between Glasgow and Edinburgh, a carrier in a single horse cart, weighing about seven hundred weight, will take a load of a ton, and at the rate of twenty-two miles in a day. The Normandy carriers travel with a team of four horses, and from fourteen to twenty-two miles in a day, with a load of ninety hundred weight.

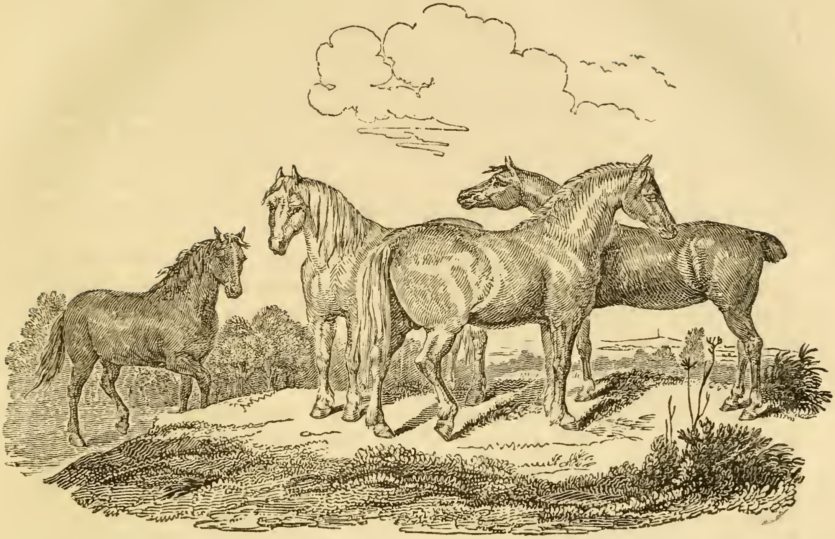
An unparalleled instance of the power of a horse when assisted by art, was shewn near Croydon. The Surrey iron railway being completed, a wager was laid by two gentlemen, that a common horse could draw thirty-six tons for six miles along the road, and that he should draw his weight from a dead pull, as well as turn it round the occasional windings of the road. A numerous party of gentlemen assembled near Merstham to see this extraordinary triumph of art. Twelve waggons loaded with stones, each waggon weighing above three tons, were chained together, and a horse, taken promiscuously from the timber cart of Mr. Harwood, was yoked to the train. He started from the Fox public-house, near Merstham, and drew the immense chain of waggons, with apparent ease, almost to the turnpike at Croydon, a distance of six miles, in one hour and forty-one minutes, which is nearly at the rate of four miles an hour. In the course of the journey he stopped four times, to shew that it was not by any advantage of descent that this power was acquired; and after each stoppage he again drew off the chain of waggons with great ease. Mr. Banks, who had wagered on the power of the horse, then desired that four more loaded waggons should be added to the cavalcade, with which the same horse set off again with undiminished pace. Still further to shew the effect of the railway in facilitating motion, he directed the attending workmen, to the number of fifty, to mount on the waggons, and the horse proceeded without the least distress; and, in truth, there appeared to be scarcely any limitation to the power of his draught. After this trial the waggons were taken to the weighing-machine, and it appeared that the whole weight was as follows:—

	Ton.	*Cwt.*	*Qr.*
12 Waggons first linked together	38	4	2
4 Ditto, afterwards attached	13	2	0
Supposed weight of fifty labourers	4	0	0
	55	6	2

HEAVY DRAUGHT HORSES.

The Cleveland horses have been known to *carry* more than seven hundred pounds sixty miles in twenty-four hours, and to perform this journey four times in a week; and mill-horses have carried nine hundred and ten pounds two or three miles.

Horses for slower draught, and sometimes even for the carriage, are produced from the Suffolk Punch, so called from his round punchy make, and descended from the Norman stallion and the Suffolk cart mare. The true Suffolk, like the Cleveland, is now nearly extinct. It stood from fifteen to sixteen hands high, of a sorrel colour; was large headed; low shouldered, and thick on the top; deep and round chested; long backed; high in the croup; large and strong in the quarters; full in the flanks; round in the legs; and short in the pasterns. It was the very horse to throw



Northamptonshire. *Clydesdale.* *Suffolk.* *Cleveland.*

his whole weight into the collar, with sufficient activity to do it effectually, and hardihood to stand a long day's work.

The present breed possesses many of the peculiarities and good qualities of its ancestors. It is more or less inclined to a sorrel colour; it is a taller horse; higher and finer in the shoulders; and is a cross with the Yorkshire half or three-fourths bred.

The excellence, and a rare one, of the old Suffolk (the new breed has not quite lost it) consisted in nimbleness of action, and the honesty and continuance with which he would exert himself at a dead pull. Many a good draught-horse knows well what he can effect; and, after he has attempted it and failed, no torture of the whip will induce him to strain his powers beyond their natural extent. The Suffolk, however, would tug at a dead pull until he dropped. It was beautiful to see a team of true Suffolks, at a signal from the driver, and without the whip, down on their knees in a moment, and drag everything before them. Brutal wagers were frequently laid as to their power in this respect, and many a good team was injured and ruined. The immense power of the Suffolk is accounted for by the low position of the shoulder, which enables him to throw so much of his weight into the collar.

Although the Punch is not what he was, and the Suffolk and Norfolk farmer can no longer boast of ploughing more land in a day than any one else, this is undoubtedly a valuable breed.

The Duke of Richmond obtained many excellent carriage horses, with strength, activity, and figure, by crossing the Suffolk with one of his best hunters.

The Suffolk breed is in great request in the neighbouring counties of Norfolk and Essex. Mr. Wakefield, of Barnham in Essex, had a stallion for which he was offered four hundred guineas.

The Clydesdale is a good kind of draught-horse, and particularly for farming business and in a hilly country. It derives its name from the district on the Clyde in Scotland, where it is principally bred. The Clydesdale horse owes its origin to one of the Dukes of Hamilton, who crossed some of the best Lanark mares with stallions which he had brought over from Flanders. The Clydesdale is larger than the Suffolk, and has a better head, a longer neck, a lighter carcase, and deeper legs; strong, hardy, pulling true, and rarely restive. The southern parts of Scotland are principally supplied from this district; and many Clydesdales, not only for agricultural purposes, but for the coach and the saddle, find their way to the central, and even southern counties of England. Dealers from almost every part of the United Kingdom attend the markets of Glasgow and Rutherglen.

The HEAVY BLACK HORSE is the last variety it may be necessary to notice. It is bred chiefly in the midland counties from Lincolnshire to Staffordshire. Many are bought up by the Surrey and Berkshire farmers at two years old,—and being worked moderately until they are four, earning their keep all the while, they are then sent to the London market, and sold at a profit of ten or twelve per cent.

It would not answer the *breeder's* purpose to keep them until they are fit for town-work. He has plenty of fillies and mares on his farm for every purpose that he can require; he therefore sells them to a person nearer the metropolis, by whom they are gradually trained and prepared. The traveller has probably wondered to see four of these enormous animals in a line before a plough, on no very heavy soil, and where two lighter horses would have been quite sufficient. The farmer is training them for their future destiny; and he does right in not requiring the exertion of all their strength, for their bones are not yet perfectly formed, nor their joints knit; and were he to urge them too severely, he would probably injure and deform them. By the gentle and constant exercise of the plough, he is preparing them for that *continued and equable* pull at the collar, which is afterwards so necessary. These horses are adapted more for parade and shew, and to gratify the ambition which one brewer has to outvie his neighbour, than for any peculiar utility. They are certainly noble-looking animals, with their round fat carcases, and their sleek coats, and the evident pride which they take in themselves; but they eat a great deal of hay and corn, and at hard and long-continued work they would be completely beaten by a team of active muscular horses an inch and a half lower.

The only plea which can be urged in their favour, beside their fine appearance, is, that as shaft-horses, over the badly-paved streets of the metropolis, and with the immense loads they often have behind them, great bulk and weight are necessary to stand the unavoidable shaking and battering. Weight must be opposed to weight, or the horse would sometimes be quite thrown off his legs. A large heavy horse must be in the shafts, and then little ones before him would not look well.

Certainly no one has walked the streets of London without pitying the poor thill-horse, jolted from side to side, and exposed to many a bruise, unless, with admirable cleverness, he accommodates himself to every motion; but, at the same time, it must be evident, that bulk and fat do not always constitute strength, and that a compact muscular horse, approaching to sixteen hands high, would acquit himself far better in such a situation. The dray-horse, in the mere act of ascending from the wharf, may display a powerful effort, but he afterwards makes little exertion, much of his force being expended in transporting his own overgrown mass.

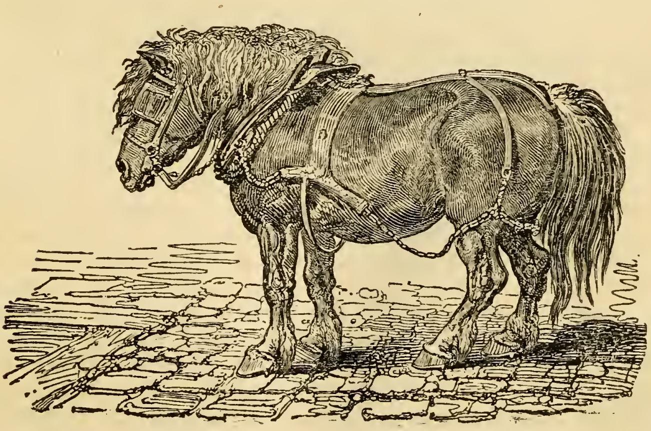
These heavy horses are bred in the highest perfection, *as to size*, in the fens of Lincolnshire, and few of them are less than seventeen hands high at two and a half years old. Neither the soil, nor the produce of the soil, is better than in other counties; on the contrary, much of the lower part of Lincolnshire is a cold, hungry clay. The true explanation of the matter is, that there are certain situations better suited than others to different kinds of farming, and the breeding of different animals; and that not altogether depending on richness of soil or pasture. The principal art of the farmer is, to find out what will best suit his soil, and the produce of it.

A dray-horse should have a broad breast, and thick and upright shoulders, (the more upright the collar stands on him the better;) a low forehand, deep and round barrel, loins broad and high, ample quarters, thick fore-arms and thighs, short legs, round hoofs, broad at the heels, and soles not too flat. The great fault of the large dray-horse is, his slowness. This is so much in the breed, that even the discipline of the ploughman, who would be better pleased to get through an additional rood in the day, cannot permanently quicken him. Surely the breeder might obviate this. Let a dray-mare be selected, as perfect as can be obtained. Let her be put to the strongest, largest, most compact, thorough-bred horse. If the produce be a filly, let her be covered by a superior dray-horse, and the result of this cross, if a colt, will be precisely the animal required to breed from.

The largest of this heavy breed of black horses are used as *dray-horses.* The next in size are sold as *waggon-horses;* and a smaller variety, and with more blood, constitutes a considerable part of our *cavalry*, and is likewise devoted to undertaker's work.

All our heavy draught horses, and some even of the lighter kind, have been lately much crossed by the Flanders breed, and with evident improvement. Little has been lost in depth and bulk of carcase; but the fore-hand has been raised, the legs have been flattened and deepened, and very much has been gained in activity. The slow heavy black, with his two miles and a half an hour, has been changed into a lighter, but yet exceedingly powerful horse, who will step four miles in the same time, with perfect ease, and has considerably more endurance.

THE DRAY HORSE.



This cut contains the portrait of a favourite dray-horse belonging to Messrs. Meux, and painted by Mr. Ward, R. A., to whose portfolio we hope frequently to have recourse. It is the Suffolk crossed, although not so deeply as some, with the Flanders.

This is the very system, as we shall presently describe, which has been adopted with such success in the blood-horse, and has made the English racer and hunter, and the English horse generally, what it is. As the racer is principally or purely of Eastern origin, so has the English draught horse sprung chiefly from Flemish blood, and to that blood the agriculturist has recourse for the perfection of the breed. For the dray, the spirit waggon, and not too heavy loads, and for road-work generally, a cross with the Flanders will be advantageous; but if, in London, the enormous heavy horse must be used in the coal-waggon, or the heavier load of the wharf, we must leave our midland black, with all his unwieldly bulk, untouched.

As an ordinary beast of lighter draught, and particularly in the neighbourhood of London, the worn out hackney and the refuse of the coach, and even of the hackney-coach is used. In the hay-markets of St. James's and Whitechapel are continually seen wretched teams, which would disgrace the poorest district of the poorest country. The small farmer in the vicinity of the metropolis, himself strangely inferior to the small farmer elsewhere, has too easy access to Smithfield, that sink of cruelty. They who are unacquainted with this part of the country, would scarcely think it possible, that on the forests and commons within a few miles of London, as many ragged, wild, mongrel horses are to be found, as in any district of the United Kingdom, and a good horse is scarcely by any chance bred there.

CAVALRY HORSE.

This is the proper place to speak of the *cavalry horse.* That noble animal whose varieties we are describing, so admirably adapted to contribute to our pleasure and our use, was at a very early age perverted to the destructive purposes of war; and, as if he had been destined to the murderous business, seemed to exult and triumph in the work of death.

A sacred writer, more than three thousand years ago, gives us a sublime account of the manner in which the horse, at that time, as at present, entered into the spirit of the battle (Job xxxix. 19 *et seq.*) " Hast thou given the horse strength? hast thou clothed his neck with thunder? Canst thou make him afraid as a grasshopper? The glory of his nostrils is terrible. He paweth in the valley, and rejoiceth in his strength: he goeth on to meet the armed men. He mocketh at fear and is not affrighted; neither turneth he back from the sword. The quiver rattleth against him, the glittering spear and the shield. He swalloweth the ground with fierceness and rage. He saith among the trumpets Ha! ha! He smelleth the battle afar off, the thunder of the captains and the shouting."

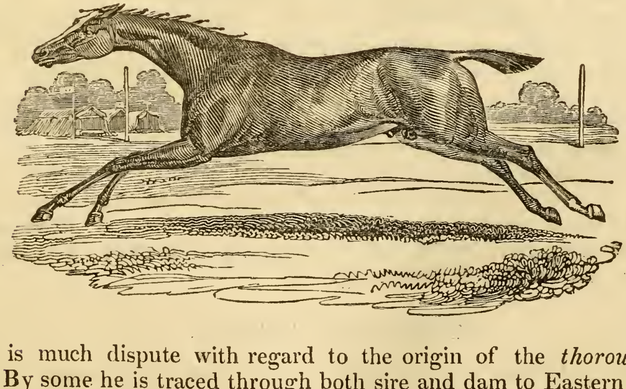
The cavalry horses contain a different proportion of blood, according to the nature of the service required, or the caprice of the commanding officer. Those of the household troops are from half to three-fourths bred. Some of the lighter regiments have more blood in them. Our cavalry horses were formerly large and heavy. To his imposing size was added action as imposing. The horse was trained to a peculiar, and grand and beautiful method of going; but he was often found deficient in real service, for this very action diminished his speed, and added to his labour and fatigue.

A considerable change has taken place in the character of our war-horses: lightness and activity have succeeded to bulk and strength; and for skirmishing and sudden attack the change is an improvement. It is particularly found to be so in long and rapid marches, which the lighter troops scarcely regard, while the heavier horses, with their more than comparative additional weight to carry, are knocked up. There was, however, some danger of carrying this too far; for it was found that in the engagements previous to, and at the battle of Waterloo, our heavy household troops alone were able to repulse the formidable charge of the French guard.

The following anecdote of the memory and discipline of the troop-horse is related on good authority. The Tyrolese, in one of their insurrections in 1809, took fifteen Bavarian horses, and mounted them with so many of their own men; but, in a skirmish with a squadron of the same regiment, no sooner did these horses hear the trumpet, and recognize the uniform of their old masters, than they set off at full gallop, and carried their riders, in spite of all their efforts, into the Bavarian ranks, where they were made prisoners.

Pliny relates a curious story about the war-horse, but, although an excellent naturalist and philosopher, he was either very credulous or too fond of the marvellous. The Sybarites trained their horses to dance. The inhabitants of Crotona, with whom they were at war, had their trumpeters taught the tunes to which the horses were accustomed to dance. When the opposing troops were in the act of charging upon each other, the Crotonian trumpeters begun to play these tunes—the Sybarite horses began to dance, and were easily defeated.

THE RACE HORSE



There is much dispute with regard to the origin of the *thorough-bred horse.* By some he is traced through both sire and dam to Eastern parentage; others believe him to be the native horse, improved and perfected by judicious crossing with the Barb, the Turk, or the Arabian. "The Stud Book," which is an authority acknowledged by every English breeder, traces all the old racers to some Eastern origin; or it traces them until the pedigree is lost in the uncertainty of an early period of breeding. If the pedigree of a racer of the present day be required, it is traced back to a certain extent, and ends with a well-known racer;—or if an earlier derivation be required, that ends either with an Eastern horse, or in obscurity.

It must, on the whole, be allowed, that the present English thorough-bred horse is of foreign extraction, improved and perfected by the influence of the climate, and by diligent cultivation. There are some exceptions, as in the case of Sampson and Bay-Malton, in each of whom, although the best horses of their day, there was a cross of vulgar blood; but they are only exceptions to a general rule. In our best racing stables, and, particularly in the studs of the Earls of Grosvenor and Egremont, this is an acknowledged principle; and it is not, when properly considered, a principle at all derogatory to the credit of the country. The British climate, and British skill, made the thorough-bred horse what he is.

The beautiful tales of Eastern countries, and somewhat remoter days, may lead us to imagine that the Arabian horse possesses marvellous powers; but it cannot admit of a doubt, that the English trained horse is more beautiful, and far swifter and stouter than the justly-famed coursers of the desert. In the burning plains of the East, and the frozen climate of Russia, he has invariably beaten every antagonist on his native ground. A few years ago, RECRUIT, an English horse of moderate reputation, easily beat PYRAMUS, the best Arabian on the Bengal side of India.

It must not be objected, that the number of Eastern horses imported is far too small to produce so numerous a progeny. It will be recollected, that the thousands of wild horses on the plains of South America descended from only two stallions and four mares, which the early Spanish adventurers left there.

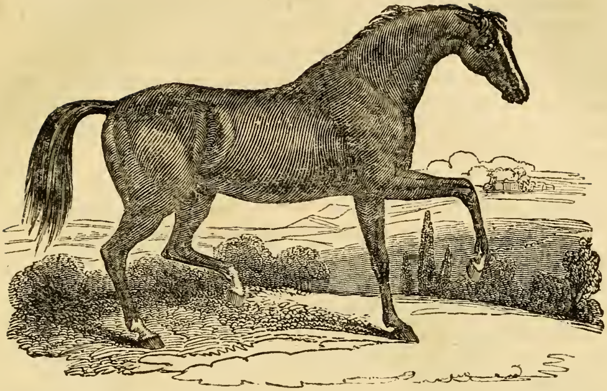
Whatever may be the truth as to the origin of the race-horse, the strictest attention has for the last fifty years been paid to pedigree. In the descent of almost every modern racer, not the slightest flaw can be discovered: or when, with the splendid exception of Sampson and Bay-Malton, one drop of common blood has mingled with the pure stream, it has been immediately detected in the inferiority of form, and deficiency of bottom, and it has required two or three generations to wipe away the stain, and get rid of its consequences.

The racer is generally distinguished by his beautiful Arabian head;—his fine and finely-set-on neck;---his oblique, lengthened shoulders;—well-bent hinder legs;—his ample, muscular quarters—his flat legs, rather short from the knee downward, although not always so deep as they should be;—and his long and elastic pastern. These are separately considered where the structure of the horse is treated of.

The racer, however, with the most beautiful form, is occasionally a sorry animal. There is sometimes a want of energy in an apparently faultless shape, for which there is no accounting; but there are two points among those just enumerated, which will rarely or never deceive, a well-placed shoulder, and a well-bent hinder leg.

THE DARLEY ARABIAN.

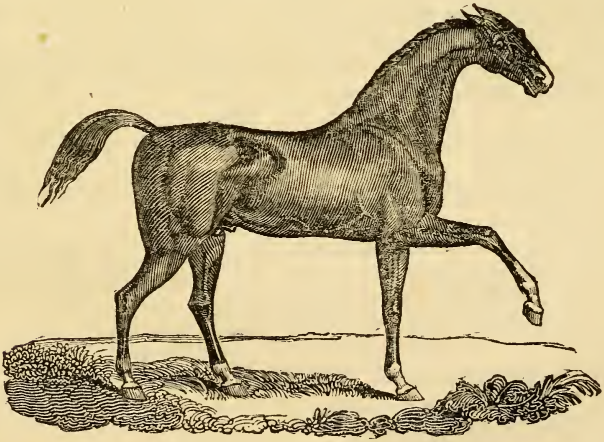
The Darley Arabian was the parent of our best racing stock. He was purchased by Mr. Darley's brother, at Aleppo, and was bred in the neighbouring desert of Palmyra. The figure here given of him is supposed to be an accurate delineation. It contains every point, without much show, which could be desired in a turf-horse.



The immediate descendants of this invaluable horse, were the Devonshire or Flying Childers; the Bleeding or Bartlett's Childers, who was never trained; Almanzor, and others.

The two Childers were the means through which the blood and fame of their sire were widely circulated, and from them descended another Childers, Blaze, Snap, Sampson, Eclipse, and a host of excellent horses.

FLYING CHILDERS.



The Devonshire or Flying Childers, so called from the name of his breeder, Mr. Childers, of Carr-House, and the sale of him to the Duke of Devonshire, was the fleetest horse of his day. He was at first trained as a hunter, but the superior speed and courage which he discovered caused him to be soon transferred to the turf. Common report affirms, that he could run a mile in a minute, but there is no authentic record of this. Childers ran over the round course at Newmarket (three miles six furlongs and ninety-three yards) in six minutes and forty seconds; and the Beacon course (four miles one furlong and one hundred and thirty-eight yards) in seven minutes and thirty seconds. In 1772, a mile was run by Firetail, in one minute and four seconds.

In October 1741, at the Curragh meeting in Ireland, Mr. Wilde engaged to ride one hundred and twenty-seven miles in nine hours. He performed it in six hours and twenty-one minutes. He employed ten horses, and, allowing for mounting and dismounting, and a moment for refreshment, he rode for six hours at the rate of twenty miles an hour.

Mr. Thornhill, in 1745, exceeded this, for he rode from Stilton to London and back, and again to Stilton, being two hundred and thirteen miles, in eleven hours and thirty-four minutes, which is, after allowing the least possible time for changing horses, twenty miles an hour for eleven hours, and on the turnpike road and uneven ground.

Mr. Shaftoe, in 1762, with ten horses, and five of them ridden twice, accomplished fifty miles and a quarter, in one hour and forty-nine minutes. In 1763, Mr. Shaftoe won a more extraordinary match. He was to procure a person to ride one hundred miles a day, on any one horse each day, for twenty-nine days together, and to have any number of horses not exceeding twenty-nine. He accomplished it on fourteen horses; and on one day he rode one hundred and sixty miles, on account of the tiring of his first horse.

Mr. Hull's Quibbler, however, afforded the most extraordinary instance on record, of the stoutness as well as speed of the race-horse. In December 1786, he ran twenty-three miles round the flat at Newmarket, in fifty-seven minutes and ten seconds.

ECLIPSE.

ECLIPSE was got by Marsk, a grandson of Bartlett's Childers *.

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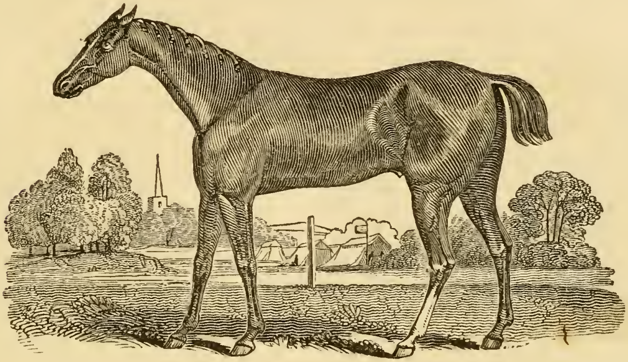
* The pedigree of Eclipse affords a singular illustration of the descent of our thorough bred horses from pure Eastern blood.

- ECLIPSE.
  - Marsk...
    - Squirt...
      - Bartlett's Childers.
        - Darley Arabian.
        - Betty Leeds
          - Careless
            - Shanker
              - Barb Mare.
      - Dam of Caroline and Shock.
        - Snake ...
          - Lister Turk.
          - Daughter of Hautboy.
            - Hautboy.
              - D'Arcey White Turk,
              - Royal Mare.
        - Daughter of Hautboy.
          - Hautboy.
    - Daughter of
      - Hutton's Black Legs
        - Hutton's Bay Turk.
        - Daughter of
          - Coneyskins.
            - Lister Turk.
          - Daughter of
            - Hautboy.
      - Daughter of
        - Fox Cub..
          - Clumsy
            - Hautboy.
          - Daughter of
            - Leeds Arabian.
        - Daughter of
          - Coneyskins
            - Lister Turk.
          - Daughter of
            - Hutton's Grey Barb.
  - Spiletta..
    - Regulus..
      - Godolphin Arabian.
      - Daughter of
        - Bald Galloway.
        - Daughter of
          - Snake
            - Lister Turk.
          - Old Wilkes, by Hautboy.
    - Mother Western
      - Smith's Son of Snake.
      - Old Montague
        - Daughter of Hautboy.

The pedigree of Eclipse will likewise afford us another curious illustration of the uncertainty which attends thorough-bred horses. MARSK was sold at the sale of the Duke of Cumberland's stud for a mere trifle, and was suffered to run almost wild on the New Forest. He was afterwards purchased by the Earl of Abingdon, for one thousand guineas, and before his death, covered for one hundred guineas. SQUIRT, when the property of Sir Harry Harpur, was ordered to be shot, and while he was actually leading to the dog-kennel, he was spared at the intercession of one of Sir Harry's grooms; and neither BARTLETT'S CHILDERS, nor SNAKE, was ever trained. On the side of the dam, SPILETTA

Of the beauty, yet peculiarity of his form, much has been said. The very great size, obliquity, and lowness of his shoulders were the objects of general remark—with the shortness of his fore-quarters, his ample and finely proportioned quarters, and the swelling muscles of his fore-arm and thigh. Of his speed, no correct estimate can be formed, for he never met with an opponent sufficiently fleet to put it to the test.



He was bred by the Duke of Cumberland, and sold at his death to Mr. Wildman, a sheep salesman, for seventy-five guineas. Colonel O'Kelly purchased a share of him from Wildman. In the spring of the following year, when the reputation of this wonderful animal was at its height, O'Kelly wished to become sole owner of him, and bought the remaining share for one thousand pounds.

Eclipse was what is termed a thick-winded horse, and puffed and roared so as to be heard at a considerable distance. For this or some other cause, he was not brought on the turf until he was five years old.

O'Kelly, aware of his horse's powers, had backed him freely on his first race, in May 1769. This excited curiosity, or, perhaps, roused suspicion, and some persons attempted to watch one of his trials. Mr. John Lawrence says, that "they were a little too late; but they found an old woman who gave them all the information they wanted. On inquiring whether she had seen a race, she replied that she could not tell whether it was a race or not, but that she had just seen a horse with white legs running away at a monstrous rate, and another horse a great way behind, trying to run after him; but she was sure he never would catch the white-legged horse if he ran to the world's end."

The first heat was easily won, when O'Kelly, observing that the rider had been pulling at Eclipse during the whole of the race, offered a wager that he placed the horses in the next heat. This seemed a thing so highly improbable, that he immediately had bets to a large amount. Being called on to declare, he replied, "Eclipse first, and the rest no where!" The event justified his prediction: all the others were distanced by Eclipse with the greatest ease; or, in the language of the turf, they had no place.

In the spring of the following year, he beat Mr. Wentworth's Bucephalus,

never started but once, and was beaten; and the Godolphin Arabian was purchased from a water-cart in Paris.—*Smith's Breeding for the Turf, p.* 5.

who had never before been conquered. Two days afterwards he distanced Mr. Strode's Pensioner, a very good horse; and, in the August of the same year, he won the great subscription at York. No horse daring to enter against him, he closed his short career of seventeen months, by walking over the Newmarket course for the king's plate, on October the 18th, 1770. He was never beaten, nor ever paid forfeit, and won for his owner more than twenty-five thousand pounds.

Eclipse was afterwards employed as a stallion, and produced the extraordinary number of three hundred and thirty-four winners, and these netted to their owners more than a hundred and sixty thousand pounds exclusive of plates and cups. This fine animal died in 1789, at the age of twenty-five years [*].

More than twenty years after the Darley Arabian, and when the value of the Arabian blood was fully established, Lord Godolphin possessed a beautiful, but singularly-shaped horse, which he called an Arabian, but which was really a Barb. His crest, lofty and arched almost to a fault, will distinguish him from every other horse.

It will likewise be seen from our plate (*vide* p. 9), that he had a sinking behind his shoulders, almost as peculiar, and a corresponding elevation of the spine towards the loins. His muzzle was uncommonly fine, his head beautifully set on, his shoulders capacious, and his quarters well spread out. He was picked up in France, where he was actually employed in drawing a cart; and when he was afterwards presented to Lord Godolphin, he was in that nobleman's stud a considerable time before his value was discovered. It was not until the birth of Lath, one of the first horses of that period, that his excellence began to be appreciated. He was then styled an Arabian, and became, in even a greater degree than the Darley, the founder of the modern thorough-bred horses. He died in 1753, at the age of twenty-nine.

An intimate friendship subsisted between him and a cat, which either sat on his back when he was in the stable, or nestled as closely to him as she could. At his death, the cat refused her food, and pined away, and soon died.—Mr. Holcroft gives a similar relation of the attachment between a race-horse and a cat, which the courser would take in his mouth and place in his manger and upon his back without hurting her. Chillaby, called from his great ferocity the Mad Arabian, whom one only of the grooms dared to approach, and who savagely tore to pieces the image of a man that was purposely placed in his way, had his peculiar attachment to a lamb, who used to employ himself for many an hour, in butting away the flies from him.

Another foreign horse, whose portrait we have given (*vide* p. 11), was the WELLESLEY ARABIAN; the very picture of a beautiful wild horse of the desert. His precise country was never determined. He is evidently neither a perfect Barb, nor a perfect Arabian, but from some neighbouring province, where both the Barb and Arabian would expand to a more perfect fulness of form. This horse has been erroneously selected as the pattern of a superior Arabian, and therefore we have introduced him; few, however, of his produce were trained who can add much to his reputation.

It has been imagined that the breed of racing horses has lately very considerably degenerated. This is not the case. Thorough-bred horses were formerly fewer in number, and their performances created greater wonder. The breed has now increased twenty-fold, and superiority is not so easily obtained among so many competitors. If one circumstance could, more than any other, produce this degeneracy, it would be our absurd and cruel habit of bringing out horses too soon, and the frequent failure of their legs before they have come to their full power. Childers and Eclipse did not appear until they were five years old; but many of our best horses, and those, perhaps, who would have shewn equal excellence with the most celebrated racers, are foundered and destroyed before that period.

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[*] The produce of King Herod, a descendant of Flying Childers, was even more numerous. He got no less than four hundred and ninety-seven winners, who gained for their proprietors upwards of two hundred thousand pounds. Highflyer was a son of King Herod.

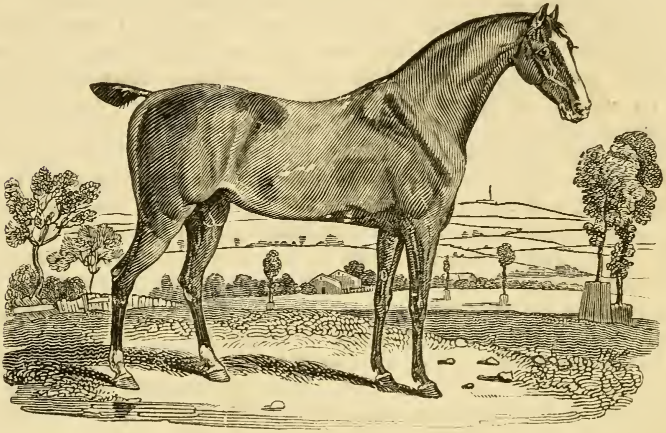
Whether the introduction of short races, and so young horses, be advantageous, and whether stoutness and usefulness may not thus be somewhat too much sacrificed to speed: whether there may be danger that an animal designed for service may, in process of time, be frittered away almost to a shadow of what he was, in order that at two years old, over the one-mile-course, he may astonish the crowd by his fleetness,—are questions that more concern the sporting man than the agriculturist; and yet they concern the agriculturist too, for racing is principally valuable as connected with breeding, and as the test of breeding.

The horse enters into the spirit of the race as thoroughly as does his rider, and, without whip or spur, will generally exert his energies to the utmost to beat his opponent. It is beautiful to see him advancing to the starting-post, every motion evincing his eagerness. The signal is given, and he springs away—he settles himself in his stride—the jockey becomes a part and portion of him, every motion of the arms and body corresponding with, and assisting the action of the horse. On he goes, eager, yet husbanding his powers. At length, when he arrives at that distance from which the rider knows that he will *live home* at the top of his speed, the hint is given, and on he rushes. Then the race in reality begins, and every nerve is strained to head his competitor. Then, too, comes the art of the rider, to keep the horse within his pace, and with admirable *give and take*, add to the length of every stride. Then, perhaps, the spur, skilfully applied, may be necessary to rouse every dormant energy. A sluggish lurching horse may need more punishment than the humane observer would think justifiable. But the natural ardour of the race-horse, roused at the moment of the grand struggle, by the moderate application of the whip and spur, will bring him through if he can win.

Forrester will afford sufficient illustration of the natural emulation of the courser.—He had won many a hardly contested race; at length, over-weighted and over-matched, the rally had commenced. His opponent, who had been waiting behind, was gaining upon him; he overtook him, and they continued quite close to within the distance. It was a point that could scarcely be decided. But Forrester's strength was failing. He made one desperate plunge—seized his antagonist by the jaw to hold him back, and could scarcely be forced to quit his hold. In like manner, a horse belonging to Mr. Quin, in 1753, finding his adversary gradually passing him, seized him by the leg, and both riders were obliged to dismount, in order to separate the animals. Let us here pause and ask, would the butcherly whipping and cutting which seems so often to form the expected and necessary conclusion of the race—the supposed display of the skill of the rider—the exultation of the thoughtless or unfeeling spectator—would these have carried such horses over one additional inch of ground? They would have been thrown abroad—they would have shortened their stroke—and perhaps would have become enraged and suspended every exertion.

The horse is as susceptible of pleasure and pain as ourselves. He was committed to us for our protection and our use; he is a willing, devoted servant. Whence did we derive the right to abuse him? Interest speaks the same language. Many a race has been lost by the infliction of wanton cruelty *.

THE HUNTER.



There are few agriculturists who have not a little liking for the sports of the field, and who do not fancy rich music in the cry of the hounds. To what extent it may be prudent for them to indulge in these sports circumstances must decide, and they deserve the most serious consideration. Few can, or, if they could, ought to keep a hunter. There are temptations to expense in the field, and to expense after the chase, which it may be difficult to withstand. The hunter, however, or the hunting horse,

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* One of the severest plate-races on record, was run at Carslile, in 1761, and in which there were no fewer than six heats, and two of them were dead heats, each of which was contested by the winner of the plate.

In 1763 at Salisbury, and over a four-mile course, there were four heats between two horses, the Duke of Grafton's Havannah and Mr. Wildman's Pam.

The following table of the abbreviations used in designating the different courses at Newmarket, and the length of these courses, may not be unacceptable.

	Abbrev.	*Miles.*	*Furl.*	*Yds.*
The Beacon course	B. C. is	4	1	138
Last three miles of ditto	L. T. M.	3	0	45
From the Ditch in	D. I.	2	0	97
From the turn of the lands in	T. L. I.	0	5	184
Clermont course	C. C.	1	5	217
Across the Flat	A. F.	1	1	44
Two-year old course	T. Y. C.	0	5	136
Yearling course	Y. C.	0	2	147
Round course	R. C.	3	6	93
Ditch mile	D. M.	0	7	148
Abingdon mile	A. M.	0	7	211
Rowley mile	R. M.	1	0	1
Two middle miles of B. C.	T. M. M.	1	7	115

A **Distance** is the length of two hundred and forty yards from the winning post. In the gallery of the winning post, and in a little gallery at the distance post, are placed two men holding crimson flags. As soon as the first horse has passed the winning post, the man *i. e.* the horse on which a farmer, if he be not a professed sportsman, may occasionally with pleasure, and without disgrace, follow the hounds, is in value and beauty next to the racer.

He should seldom be under fifteen or more than sixteen hands high; below this standard he cannot always sufficiently measure the object before him, and above this, he is apt to be leggy and awkward at his work.

In proportion as the agriculture of the country is improved, the speed of the chase is increased. The scent both of the fox and the hare will lie better in inclosed and well-cultivated ground, than on open, barren heaths; and there is more running *breast-high* than when the hound is compelled to pick out the scent, carrying his nose almost close to the ground, and consequently going more slowly. The character of the hunter is consequently gradually changing. Stoutness is still required, but speed is becoming more necessary, and, therefore, for the fox, and the deer, and even for the hare, blood is an essential quality.

In strong, thickly inclosed countries, the half-bred horse may get tolerably well along; but for general use the hunter should be at least three-quarters bred, perhaps seven-eighths. If he could be obtained with bone enough, and different action, a *thorough-bred horse* would form the best of all hunters: but the thorough-bred horse, with the usual action of the racer, would not, even at three-quarters speed, always carry himself sufficiently high to be aware of and to clear his fences.

The first property of a good hunter is, that he should be light in hand. For this purpose his head must be small; his neck thin; and especially thin beneath; his crest firm and arched, and his jaws wide. The head will then be well set on. It will form that angle with the neck, which gives a light and pleasant mouth.

Somewhat of a ewe-neck, however it may lessen the beauty of the race-horse, does not interfere with his speed, because, as is shewn where the structure of the horse is considered, more weight may be thrown forward, and consequently the whole bulk of the animal more easily impelled; at the same time, the head is more readily and perfectly extended, the wind-pipe is brought almost to a straight line from the lungs to the muzzle, and the breathing is freer. Should the courser, in consequence of this form of the neck, bear more heavily on the hand, the race is soon over; but the hunter may be our companion and our servant through a long day, and it is of essential consequence that he shall not too much annoy and tire us by the weight of his head and neck.

The forehand should be loftier than that of the racer. A turf horse may be forgiven if his hind quarters rise an inch or two above his fore ones. His principal power is wanted from behind, and the very lowness of the

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drops his flag; the other at the distance post drops his at the same moment, and the horse which has not then passed that post is said to be distanced, and cannot start again for the same plate or prize.

A Feather-weight is the lightest weight that can be put on the back of a horse.

A Give and Take Plate is where horses carry weight according to their height. Fourteen hands are taken as the standard height, and the horse must carry nine stone (the horseman's stone is fourteen pounds). Seven pounds are taken from the weight for every inch below fourteen hands, and seven pounds added for every inch above fourteen hands. A few pounds additional weight is so serious an evil, that it is said, seven pounds in a mile-race are equivalent to a distance.

A Post Match is for horses of a certain age, and the parties possess the privilege of bringing any horse of that age to the post.

A Produce Match is that between the produce of certain mares in foal at the time of the match, and to be decided when they arrive at a certain age specified.

forehand may throw more weight in front, and cause the whole machine to be more easily and speedily moved. A lofty forehand, however, is indispensable in the hunter; the shoulder as extensive as in the racer;—as oblique and somewhat thicker; the saddle will then be in its proper place, and will continue so, however long may be the run.

The barrel should be rounder to give greater room for the heart and lungs to play, and send more and purer blood to the larger frame of this horse; and especially more room to play when the run may continue unchecked for a time that begins to be distressing. A broad chest is an excellence in the hunter.—In the violent and long-continued exertion of the chase, the respiration is exceedingly quickened, and abundantly more blood is hurried through the lungs in a given time than when the animal is at rest. There must be sufficient room for this, or the horse will be blown, and possibly destroyed. The majority of the horses that perish in the field are narrow chested.

The arm should be as muscular as that of the courser, or even more so, for both strength and endurance are wanted.

The leg should be deeper than that of the race horse (broader as you stand at the side of the horse), and especially beneath the knee. In proportion to the distance of the tendon from the cannon or shank-bone, and more particularly just below the knee, is the mechanical advantage with which it acts. A racer may be tied beneath the knee, without perfectly destroying his power, but a hunter with this defect will rarely have stoutness.

If any objection be made to our cut of the hunter, it will be that the mare was too fine below the knee. It was the only bad point in an almost perfect form. She was the property of T. Millington, Esq., to whose kindness we are indebted for permission to copy her portrait. She would go over anything, and was never tired.

The leg should be shorter. Higher action is required than in the racer, that the legs may be clearly and safely lifted over many an obstacle, and, particularly, that they may be well doubled up in the leap.

The pastern should be shorter, and less slanting, yet retaining considerable obliquity. The long pastern is useful, by the yielding resistance which its elasticity affords, to break the concussion with which the race-horse from his immense stride and speed must come on the ground: and the oblique direction of the different bones beautifully contributes to effect the same purpose. With this elasticity, however, a considerable degree of weakness is necessarily connected, and the race-horse occasionally breaks down in the middle of his course. The hunter, from his different action, takes not this length of stride, and therefore wants not all this elastic mechanism; he more needs strength to support his own heavier carcase, and the greater weight of his rider, and to undergo the fatigue of a long day. Some obliquity, however, he requires, otherwise the concussion even of his shorter gallop, and more particularly of his frequently tremendous leaps, would inevitably lame him.

The foot of the hunter is a most material point. It is of consequence in the racer, yet it is a notorious fact, that many of our best thorough-bred horses have had very indifferent feet. The narrow contracted foot is the curse of much of the racing blood. The work of the racer, however, is all performed on the turf, and his bad feet may scarcely incommode him; but the foot of the hunter is battered over many a flinty road and stony field, and if not particularly good, will soon be disabled and ruined.

The position of the feet requires some attention in the hunter. They should if possible stand straight. If they turn a little outward there is no serious objection; but if they turn inward his action cannot be safe, particularly when he is fatigued or over-weighted.

The body should be short and compact, compared with that of the race-horse, that he may not in his gallop take too extended a stride. This would be a serious disadvantage in a long day and with a heavy rider, from the stress on the pasterns; and more serious when going over clayey poached ground, during the winter months. The compact short-strided horse will almost skim the surface, while the feet of the longer-reached animal will sink deep, and he will wear himself out by efforts to disengage himself.

Every horseman knows how much more enduring is a short-bodied horse in climbing hills, although perhaps not quite so much in descending them. This is the secret of suiting the *race-horse* to his course; and unfolds the apparent mystery of a decidedly superior horse on a flat and straight course, being often beaten by a little horse, with far shorter stride on uneven ground, and with several turnings.

The loins should be broad;—the quarters long;—the thighs muscular;—the hocks well bent, and well under the horse.

The reader needs not be told how essential temper and courage are. A hot irritable brute is a perfect nuisance, and the coward that will scarcely face the slightest fence exposes his owner to ridicule.

The training of the race-horse has not been touched upon. It contains too much mystery, and too much absurdity for common understandings. The *principle* however of preparing both the race-horse and the hunter for their work is the same, and can have no mystery about it; *viz.*, by physic and by exercise, to get rid of all superfluous fat and flesh, without too much lowering the animal; and, particularly to bring him by dint of exercise into good wind, and accustom him to the full trial of his powers, without over-straining or injuring him. Two or three doses of physic as the season approaches, and these not too strong; plenty of good hard meat; and a daily gallop of a couple of miles, and at a pace not too quick, will be nearly all that can be required. Physic must not be omitted; but the three words *air*, *exercise*, *food*, contain the grand secret and art of training.

Some think that even the simple process now described is not necessary, and that horses that are taken up and worked in the day, and with a feed or two of corn, and turned out at night, with an open stable or shed to run into if they please, are as active, healthy, and enduring, as those who are most carefully trained, and confined to the stable during the hunting season. Many a farmer has boasted, that he can beat the most numerous and the best-appointed field, and that his horse never wants wind, and rarely tires.

It is true that the farmer may enjoy a good day's sport on the horse that carries him to market, or possibly, occasionally performs more menial drudgery; but the frothy lather with which such a horse is covered in the early part of the day evinces undeniable inferiority. There is, however, one point on which the untrained horse has the advantage. Accustomed to all weathers, he rarely suffers, when, after a sharp burst, there comes a sudden check, and the pampered and shivering stabled horse is exposed with him for a considerable time to a piercing north-easter. The one cares nothing about it; the other may carry home the seeds of dangerous disease.

The hunter may be fairly ridden twice, or, if not with any very hard days, three times in the week; but, after a thoroughly hard day, and evident distress, three or four days' rest should be allowed. They who are merciful to their horses, allow about thirty days' work in the course of the season; with gentle exercise on each of the intermediate days, and particularly a sweat on the day before hunting. There is an account, however, of one horse who followed the fox-hounds seventy-five times in one season. This feat has never been exceeded.

We recollect to have seen the last Duke of Richmond but one, although an old man, and when he had the gout in his hands so severely that he was obliged to be lifted on horseback, and both arms, being passed through the reins, were crossed on his breast, galloping down the steepest part of Bow Hill, in the neighbourhood of Goodwood, almost as abrupt as the ridge of an ordinary house, and cheering on the hounds with all the ardour of a youth*.

The horse fully shares in the enthusiasm of his rider. It is beautiful to watch the old hunter, who, after many a winters' hard work, is turned into the park to enjoy himself for life. His attitude and his countenance when, perchance, he hears the distant cry of the dogs, are a study. If he can he will break his fence, and, over hedge, and lane, and brook, follow the chase, and come in first at the death.

A horse that had, a short time before, been severely fired on three legs, and was placed in a loose box, with the door, four feet high, closed, and an aperture over it little more than three feet square, and standing himself nearly sixteen hands, and master of fifteen stone, hearing the cheering of the huntsman and the cry of the dogs at no great distance, sprung through the aperture without leaving a single mark on the bottom, the top, or the sides.

Then, if the horse be thus ready to exert himself for our pleasure—and pleasure alone is here the object—it is indefensible and brutal to urge him beyond his own natural ardour, so severely as we sometimes do, and even until nature is quite exhausted. We do not often hear of a "hard-day," without being likewise informed, that one or more horses either died in the field, or scarcely reached home before they expired. Some have been thoughtless and cruel enough to kill two horses in one day. One of the severest chases on record was by the King's stag-hounds. There was an uninterrupted burst of four hours and twenty minutes. One horse dropped dead in the field; another died before he could reach the stable; and seven more within a week afterwards.

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* Sir John Malcolm (in his Sketches of Persia) gives an amusing account of the impression which a fox-hunt in the English style made on an Arab.

"I was entertained by listening to an Arab peasant, who, with animated gestures, was narrating to a group of his countrymen all he had seen of this noble hunt. 'There came the fox,' said he, pointing with a crooked stick to a clump of date trees, 'there he came at a great rate. I hallooed, but nobody heard me, and I thought he must get away; but when he got quite out of sight, up came a large spotted dog, and then another and another. They all had their noses to the ground, and gave tongue—whow, whow, whow, so loud, I was frightened. Away went these devils, who soon found the poor animal. After them galloped the Foringees (a corruption of Frank, the name given to an European over all Asia), shouting and trying to make a noise louder than the dogs. No wonder they killed the fox among them.'"

The Treasurer, Burleigh, the sage councillor of Queen Elizabeth, could not enter into the pleasures of the chase. Old Andrew Fuller relates a quaint story of him:—

"When some noblemen had gotten William Cecill Lord Burleigh to ride with them a hunting, and the sport began to be cold, 'What call you this?' said the treasurer. 'Oh! now the dogs are at fault,' was the reply. 'Yea,' quoth the treasurer, 'take me again in such a fault, and I'll give you leave to punish me.'"

In former times it was the fashion for women to hunt almost as often and as keenly as the men. Queen Elizabeth was extremely fond of the chase. Rowland Whyte, in a letter to Sir Robert Sidney, says, "Her majesty is well, and excellently disposed to hunting; for every second day she is on horseback, and continues the sport long."

This custom soon afterwards began to decline, and the jokes and sarcasms of the witty court of Charles II. contributed to discountenance it.

It is a curious circumstance, that the first work on hunting that proceeded from the press, was from the pen of a female, Juliana Barnes, or Berners, the sister of Lord Berners, and prioress of the nunnery of Sopewell, about the year 1481.

It is very conceivable, and does sometimes happen, that, entering as fully as his master into the sports of the day, the horse disdains to yield to fatigue, and voluntarily presses on, until nature is exhausted, and he falls and dies; but, much oftener, the poor animal has, intelligibly enough, hinted his distress; unwilling to give in, yet painfully and faulteringly holding on. The merciless rider, rather than give up one hour's enjoyment, tortures him with whip and spur, until he drops and expires.

Although the hunter may be unwilling to relinquish the chase, he who "is merciful to his beast" will soon recognize the symptoms of excessive and dangerous distress. To the drooping pace and staggering gait, and heaving flank, and heavy bearing on hand, will be added a very peculiar noise. The inexperienced person will fancy it to be the beating of the heart; but that has almost ceased to beat, and the lungs are becoming gorged with blood. It is the convulsive motion of the muscles of the belly, called into violent action to assist in the now laborious office of breathing. The man who proceeds a single mile after this ought to suffer the punishment he is inflicting*.

Let the rider instantly dismount. If he has a lancet, and skill to use it, let him take away five or six quarts of blood; or if he has no lancet, let him cut the burs with his pocket knife as deeply as he can. The lungs may be thus relieved, and the horse may be able to crawl home. Then, or before, if possible, let some powerful cordial be administered. Cordials are, generally speaking, the disgrace and bane of the stable; but here, and almost here alone, they are truly valuable. They may rouse the exhausted powers of nature; they may prevent what the medical man would call the reaction of inflammation; although they are the veriest poison when inflammation has commenced.

A favourite hunter fell after a long burst, and lay stretched out, convulsed, and apparently dying. His master procured a bottle of good sherry from the house of a neighbouring friend, and poured it down the animal's throat. The horse immediately began to revive; soon after got up; walked home, and gradually recovered. The sportsman may not always be able to get this, but he may obtain a cordial-ball from the nearest farrier, or he may beg a little ginger from some good house-wife, and mix it with warm ale, or he may give the ale alone, or strengthened with a little rum or gin. When he gets home, or if he stops at the first stable he finds, let the horse be put into *the coolest place*, and then well clothed and diligently rubbed about the legs and belly. The practice of putting the animal, thus distressed, into "a comfortable warm stable," and excluding every breath of air, has destroyed many valuable horses.

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* We should almost rejoice if the abused quadruped, cruelly urged beyond his powers, were to inflict on his rider the punishment which a Spanish ruffian received, when mercilessly torturing, in a similar way, a poor Indian slave, who was carrying him on his back over the mountains. It is thus related by Captain Cochrane, (Colombia ii. 357).—"Shortly after passing this stream, we arrived at an abrupt precipice, which went perpendicularly down about fifteen hundred feet, to a mountain torrent below. There Lieutenant Ortegas narrated to me the following anecdote of the cruelty and punishment of a Spanish officer:—This inhuman wretch, having fastened on an immense pair of mule spurs, was incessantly darting the rowels into the bare flesh of the tortured sillero, who in vain remonstrated with his persecutor, and assured him he could not quicken his pace. The officer only plied his spurs the more, in proportion to the murmurs of the sillero. At last, the man roused to the highest pitch of infuriated excitement and resentment, from the relentless attacks of the officer, on reaching this place jerked him from his chair into the immense depth of the torrent below, where he was killed, and his body could not be recovered. The sillero dashed off at full speed, escaped into the mountain, and was never after heard of."

We are now describing the very earliest treatment to be adopted, and before it may be possible to call in an experienced practitioner. This stimulating plan would be fatal twelve hours afterwards. It will, however, be the wisest course, to commit the animal, the first moment it is practicable, to the care of the veterinary surgeon, if such there be in the neighbourhood, in whom confidence can be placed.

The labours and the pleasures of the hunting season being passed, the farmer makes little or no difference in the management of his untrained horse; but the wealthier sportsman is somewhat at a loss what to do with his. It used to be thought, that when the animal had so long contributed, sometimes voluntarily, and sometimes with a little compulsion, to the enjoyment of his owner, he ought, for a few months, to be permitted to seek his own amusement, in his own way; and he was turned out for a summer's run at grass. Fashion, which governs everything, and now and then most cruelly and absurdly, has exercised her tyranny over this poor quadruped. His field, where he could wander and gambol as he liked, is changed to a loose box; and the liberty in which he so evidently exulted, to an hour's walking exercise daily. He is allowed vetches, or grass occasionally, but from his box he stirs not, except for his dull morning's round, until he is taken into training for the next winter's business.

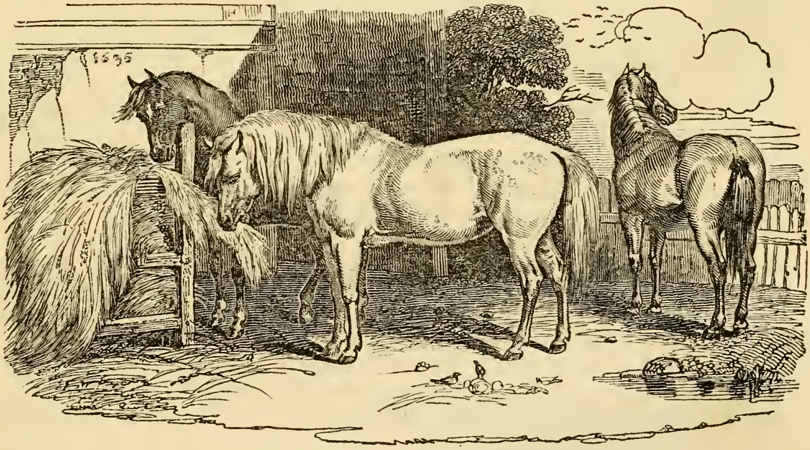
In this, however, as in most other things, there is a medium. There are few horses who have not materially suffered in their legs and feet, before the close of the hunting season. There is nothing so refreshing to their feet as the damp coolness of the grass into which they are turned in May; and nothing so calculated to remove every enlargement and sprain, as the gentle exercise which the animal voluntarily takes while his legs are exposed to the cooling process of evaporation, which is taking place from the herbage he treads. The experience of ages has shewn, that it is superior to all the embrocations and bandages of the most skilful veterinarian. It is the renovating process of nature, where the art of man fails.

The spring grass is the best physic that can possibly be administered to the horse. To a degree, which no artificial aperient or diuretic can attain, it carries off every humour which may be lurking about the animal; it fines down the roundness of the legs; and, except there be some bony enlargement, restores them almost to their original form and strength. When, however, the summer has thoroughly set in, the grass ceases to be succulent, aperient, or medicinal; the ground is no longer cool and moist, at least during the day; and a host of tormentors, in the shape of flies, are, from sun-rise to sun-set, persecuting the poor animal. Running and stamping to rid himself of his plagues, his feet are battered by the hard ground, and he newly, and perhaps more severely, injures his legs. Kept in a constant state of irritation and fever, he rapidly loses his condition, and sometimes comes up in August little better than a skeleton.

Let the horse be turned out as soon as possible after the hunting season is over. Let him have the whole of May, and the greater part, or possibly the whole of June; but when the grass fails, and the ground gets hard, and the flies torment, let him be taken up. All the benefits of turning out, and that which a loose box and artificial physic can never give, will have been obtained, without the inconvenience and injury which attend an injudiciously protracted run at grass, and which, arguing against the use of a thing from the abuse of it, have been improperly urged against turning out at all.

The *Steeple Hunt* is a relic of ancient foolhardiness and cruelty. It was the form under which the horse race, at its first establishment, was frequently decided. It is a race across the country, of two, or four, or even a greater number of miles; and it is generally contrived that there shall be some deep lane, or wide brook, and many a stiff and dangerous fence between. It is ridden at the evident hazard of the life of the sportsman; and it likewise puts to hazard the life or enjoyment of the horse. It is getting into gradual disuse, and no man whose good opinion is worth having would deem such an exhibition creditable to the head or heart of him who was engaged in it.

GALLOWAYS AND PONIES.



A horse between thirteen and fourteen hands in height is called a GALLOWAY, from a beautiful breed of little horses once found in the south of Scotland, on the shore of the Solway Firth, but now sadly degenerated, and almost lost, from the attempts of the farmers to obtain a larger kind, and better adapted for the purposes of agriculture. There is a tradition in that country, that the breed is of Spanish extraction, some horses having escaped from one of the vessels of the Grand Armada, which was wrecked on the neighbouring coast. This district, however, so early as the time of Edward I., supplied that monarch with a great number of horses.

The pure galloway was said to be nearly fourteen hands high, and sometimes more; of a bright bay, or brown, with black legs, small head and neck, and peculiarly deep and clean legs. Its qualities were speed, stoutness, and sure-footedness over a very rugged and mountainous country.

Dr. Anderson thus describes the galloway: "There was once a breed of small elegant horses in Scotland, similar to those of Iceland and Sweden, and which were known by the name of galloways; the best of which sometimes reached the height of fourteen hands and a half. One of this description I possessed, it having been bought for my use when a boy. In point of elegance of shape it was a perfect picture; and in disposition was gentle and compliant. It moved almost with a wish, and never tired. I rode this little creature for twenty-five years, and, twice in that time I rode a hundred and fifty miles at a stretch, without stopping, except to bait, and that not for above an hour at a time. It came in at the last stage with as much ease and alacrity as it travelled the first. I could have undertaken to have performed on this beast, when it was in its prime, sixty miles a-day for a twelvemonth running without any extraordinary exertion."

A galloway in point of size, whether of Scotch origin or not we are uncertain, performed, about the year 1814, a greater feat than Dr. Anderson's favourite. It started from London with the Exeter mail, and, notwithstanding the numerous changes of horses, and the rapid driving of that vehicle, it arrived at Exeter (one hundred and seventy-two miles) a quarter of an hour before the mail. We saw him about a twelvemonth afterwards, wind-galled, spavined, ring-boned, and a lamentable picture of the ingratitude of some human brutes towards a willing and faithful servant.

In 1754 Mr. Corker's galloway went one hundred miles a-day for three successive days, over the Newmarket course, and without the slightest distress.

A galloway belonging to Mr. Sinclair, of Kirby-Lonsdale, performed at Carlisle the extraordinary feat of one thousand miles in a thousand hours.

Many of the galloways now in use are procured either from Wales or the New Forest, but they have materially diminished in number: there are scarcely sufficient to supply even the neighbouring districts, and they are still more materially deteriorated in form and value. Both the Welsh and the Hampshire galloways and ponies claim, however, some noble blood.

OLD MARSK, before his value was known, contributed to the improvement of the Hampshire breed; and the Welsh ponies are said to be indebted to the celebrated MERLIN for their form and qualities.

The *Welsh pony* is one of the most beautiful little animals that can be imagined. He has a small head, high withers, deep yet round barrel, short joints, flat legs, and good round feet. He will live on any fare, and can never be tired out.

The *New-foresters*, notwithstanding their Marsk-blood, are generally ill-made, large-headed, short-necked, ragged hipped, but hardy, safe, and useful; with much of their ancient spirit and speed, and all their old paces. The catching of these ponies is as great a trial of skill, as the hunting of the wild-horse on the Pampas of South America, and a greater one of patience.

A great many ponies, of little value, used to be reared in Lincolnshire, in the neighbourhood of Boston, but the breed has been neglected for some years, and the enclosure of the fens will render it extinct.

The *Exmoor Ponies*, although generally ugly enough, are hardy and useful. A well-known sportsman says, that he rode one of them half a dozen miles, and never felt such power and action in so small a compass before. To shew his accomplishments, he was turned over a gate at least eight inches higher than his back; and his owner, who rides fourteen stone, travelled on him from Bristol to South Molton, eighty-six miles, beating the coach which runs the same road.

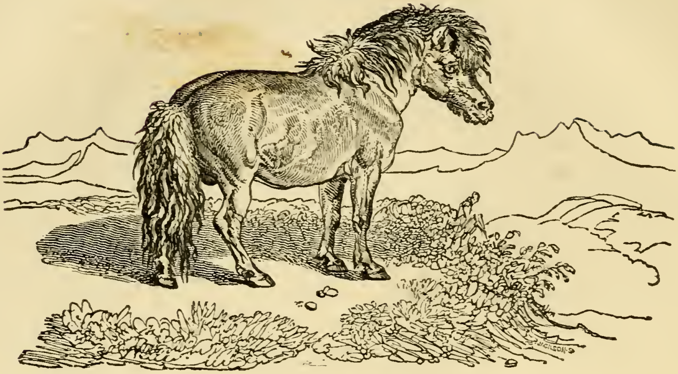
The horses which are still used in Devonshire, and particularly in the western and southern districts under the denomination of Pack-horses, are a larger variety of the Exmoor or Dartmoor breed. The saddle-horses of Devonshire are mostly procured from the more eastern counties.

There are many farms in that beautiful part of the kingdom on which there is not a pair of wheels. Hay, corn, straw, fuel, stones, dung, lime, are carried on horseback; and in harvest, sledges drawn by oxen and horses are used. This was probably in early times the mode of conveyance throughout the kingdom, and is continued in these districts, partly from the hilliness of the country, and more from backwardness in all matters of improvement. Light articles, as corn, straw, faggots, &c., are carried in *crooks*, formed of willow poles, of the thickness of scythe-handles, bent as ox-bows, and with one end much longer than the other; these are joined in pairs by cross-bars, eighteen inches or two feet long, and each horse has two pair of them, slung together, so that the shorter ends lie against the pack-saddle, and the longer stand four or five feet from each other, and rise fifteen or eighteen inches above the horse's back. Within and between these crooks the load is piled. Dung, sand, &c. are carried in *pots*, or strong coarse panniers slung together in the same way, and the dung ridged up over the saddle. At the bottom of the pot is a falling door, and at the end of the journey the trap is unlatched, and the load falls out.

There is on Dartmoor a race of ponies much in request in that vicinity, being sure-footed, and hardy, and admirably calculated to scramble over the rough roads and dreary wilds of that mountainous district. The Dartmoor pony is larger than the Exmoor, and, if possible, uglier. He exists there almost in a state of nature. The late Captain Colgrave, of the prison, had a great desire to possess one of them of somewhat superior figure to its fellows, and having several men to assist him, they separated it from the herd. They drove it on some rocks by the side of a tor (an abrupt pointed hill); a man followed on horseback, while the Captain stood below watching the chase. The little animal being driven into a corner leaped completely over the man and horse, and escaped.

The *Highland Pony* is far inferior to the galloway. The head is large, he is low before, long in the back, short in the legs, upright in the pasterns, rather slow in his paces, and not pleasant to ride, except in the canter. His habits make him hardy, for he is rarely housed in the summer or the winter. The Rev. Mr. Hall, in his "Travels in Scotland," says, "that when these animals come to any boggy piece of ground, they first put their nose to it, and then pat on it in a peculiar way with one of their fore-feet, and from the sound and feel of the ground, they know whether it will bear them. They do the same with ice, and determine in a minute whether they will proceed."

The *Shetland Pony*, called in Scotland *Sheltie*, an inhabitant of the extremest northern Scottish isles, is a very diminutive animal, sometimes not seven hands and a half in height, and rarely exceeding nine and a half. He is often exceedingly beautiful, with a small head, good-tempered countenance, a short neck, fine towards the throttle, shoulders low and thick, (in



so little a creature far from being a blemish,) back short, quarters expanded and powerful, legs flat and fine, and pretty round feet. They possess immense strength for their size, will fatten upon anything; and are perfectly docile. One of them nine hands, or three feet in height, carried a man of twelve stone, forty miles in one day.

Our cut is the portrait of a Sheltie, the property of Lord Verulam, painted by Mr. Ward. A friend of ours was, not long ago, presented with one of these elegant little animals. He was several miles from home, and puzzled how to convey his newly-acquired property. The Shetlander was scarcely more than seven hands high, and as docile as he was beautiful. "Can we not carry him in your chaise?" said his friend. The strange experiment was tried. The Sheltie was placed in the bottom of the gig, and covered up as well as could be managed with the apron; a few bits of bread kept him quiet; and thus he was safely conveyed away, and exhibited the curious spectacle of a horse riding in a gig.

In the Southern parts of the kingdom the Shetlanders have a very pleasing appearance, harnessed to a light garden chair, or carrying an almost baby rider. There are several of them now running in Windsor Park.

It has been disputed whether the pony and large English horse were, or could be, originally from the same stock. The question is difficult to answer. It is not impossible that they might have one common extraction, and, if we reflect on the effect of feeding, it is not so improbable as it may at first appear.

Mr. Parkinson * relates a circumstance very much to the point, that fell under his observation His father had a mare that brought him no less than fourteen colts, and all by the same horse, and not one of which at three years old was under seventeen hands. She was in the fifteenth foal by the same horse, when he sold her to a neighbouring farmer, reserving the foal which was to be delivered in a twelvemonth. At her new master's she was comparatively starved, and she came back at the expiration of the year so altered as scarcely to be recognised. The foal, four months old, was very small. The little animal was put on the most luxuriant keep, but it did not reach more than fifteen hands at the expiration of the third year.

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* Parkinson on Breeding, and the Management of Live Stock, vol. ii. p. 139.

THE IRISH HORSE.

In some of the rich grazing counties, as Meath and Roscommon, a large long blood horse is reared of considerable value, but he seldom has the elegance of the English horse; he is larger headed, more leggy, ragged-hipped, angular, yet with great power in the quarters, much depth beneath the knee, stout and hardy, full of fire and courage, and the best leaper in the world.

The Irish horse is generally smaller than the English. He is stinted in his growth, for the poverty and custom of the country have imposed upon him much hard work, at a time when he is unfit for labour of any kind. For this reason, too, the Irish horse is deficient in speed. There is, however, another explanation of this. The Irish thorough-bred horse is not equal to the English. He is comparatively a weedy, leggy, worthless animal, and very little of him enters into the composition of the hunter or the hackney.

For *leaping* the Irish horse is unrivalled. It is not, however, the leaping of the English horse, striding as it were over a low fence, and stretched at his full length over a higher one; it is the proper *jump* of the deer, beautiful to look at, difficult to sit, and, both in height and extent, unequalled by the English horse.

There are very few horses in the agricultural districts of Ireland exclusively devoted to draught. The minute division of the farms renders it impossible for them to be kept. The occupier even of a tolerable sized Irish farm, wants a horse that shall carry him to market, and draw his small car, and perform every kind of drudgery—a horse of all work; therefore the thorough draught horse, whether Leicestershire or Suffolk, is rarely found.

If we look to the commerce of Ireland, there are few stage waggons, or drays with immense cattle belonging to them, but almost every thing is done by one-horse carts. In the North of Ireland, some stout horses are employed in the carriage of linen, but the majority of the *garrons* used in agriculture or commercial pursuits are miserable and half-starved animals. In the north it is somewhat better. There is a native breed in Ulster, hardy, and sure-footed, but with little pretension to beauty or speed.

CHAPTER V.

THE ZOOLOGICAL CLASSIFICATION OF THE HORSE.

THERE are so many thousand species of living beings, some so much resembling each other, and some so strangely and altogether different, that it would have been impossible to have arranged them in any order, or to have given any description that could be understood, had not naturalists agreed on certain peculiarities of form which should characterize certain classes, and other lesser peculiarities again subdividing these classes.

The first division of animals is into *vertebrated* and *invertebrated.*

Vertebrated animals are those which have a *cranium*, or bony cavity containing the brain, and a succession of bones called the spine, and the divisions of it, *vertebræ*, proceeding from the cranium, and containing a prolongation of the brain, denominated the *spinal marrow.*

Invertebrated animals are those which have no vertebræ.

The horse then belongs to the *division vertebrated*, because he has a cranium or skull, and a spine or range of vertebræ proceeding from it.

The vertebrated animals, however, are very numerous. They include man, quadrupeds of all kinds, birds, fishes, and many reptiles. We look out then for some subdivision, and a very simple line of distinction is soon presented. Some of these vertebrated animals have *mammæ* or teats, with which the females suckle their young. The human female has two, the mare has two, the cow four, the bitch ten or twelve, and the sow more than twelve.

This *class* of vertebrated animals, having mammæ or teats, is called *mammalia*, and the horse belongs to the division *vertebrata*, and the class *mammalia.*

The class mammalia is still exceedingly large, and we must again subdivide it. It is stated (Library of Entertaining Knowledge, vol. i. p. 13) that " this class of quadrupeds, or mammiferous quadrupeds, admits of a division into two *Tribes.*

" I. Those whose extremities are divided into fingers or toes, scientifically called *unguiculata*, from the Latin word for *nail;* and II. Those whose extremities are hoofed, scientifically called *ungulata*, from the Latin word for *hoof.*

" The extremities of the first are armed with claws or nails, which enable them to grasp, to climb, or to burrow. The extremities of the second tribe are employed merely to support and move the body."

The extremities of the horse are covered with a hoof, by which the body is supported, and with which he cannot grasp anything, and therefore he belongs to the *tribe ungulata,* or *hoofed.*

But there is a great variety of hoofed animals. The elephant, the rhinoceros, the hippopotamus, the swine, the horse, the sheep, the deer, and many others, are *ungulated* or *hoofed;* they admit, however, of an easy division. Some of them masticate, or chew their food, and it is immediately received into the stomach and digested; but in others, the food, previous to digestion, undergoes a very singular process. It is returned to the mouth to be re-masticated, or chewed again. These are called *ruminantia*, or *ruminants*, from the food being returned, from one of the stomachs (for they have four) called the *rumen* or paunch, to be chewed again.

The *ungulata* that do not ruminate are somewhat improperly called *pachydermata*, from the thickness of their skins. The horse does not ruminate, and therefore belongs to the *order pachydermata.*

The pachydermata who have only one toe belong to the *family solipeda —single-footed.* Therefore the horse ranks under the division vertebrata; the class mammalia;—the tribe ungulata;—the order pachydermata;—and the family solipeda.

The solipeda consists of several *species*, as the horse, the ass, the mule, and the quagga.

First stands the EQUUS CABALLUS, or COMMON HORSE.

Animals are likewise distinguished according to the number, description, and situation of their teeth. The horse has 6 *incisors* or *cutting* teeth, in the front of each jaw; and one *canine* tooth or *tusk.*

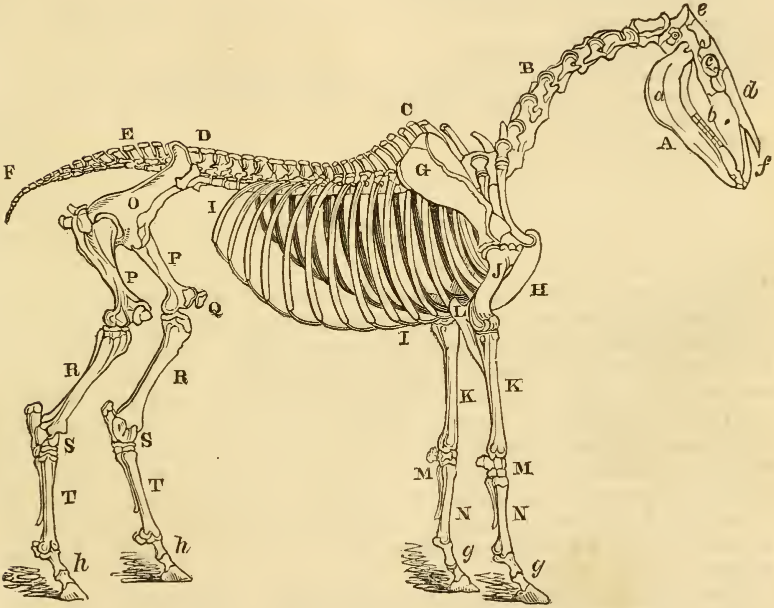
On each side, above and below, and at some distance from the incisors, behind the canines and with some intervening space, are six *molar* teeth, or grinders; and these molar teeth have flat crowns with ridges of enamel, and that enamel penetrating into the substance of the tooth.

The whole is thus represented by natural historians, and the reader will comprehend our meaning when we are speaking of other animals.

Horse.—Incisors $\frac{6}{6}$, Canines $\frac{1-1}{1-1}$, Molar $\frac{6-6}{6-6}$, Total 40 teeth.

CHAPTER VI.

THE EXTERNAL STRUCTURE OF THE HORSE.



A	The Head.
a	The posterior maxillary or under jaw.
b	The superior maxillary or upper jaw. Opposite to the letter is a foramen hrough which pass the nerves and blood-vessels which chiefly supply the lower part the face.
c	The orbit, or cavity containing the eye.
d	The nasal bones, or bones of the nose.
e	The suture dividing the parietal bones below, from the occipital bones above.
f	The inferior maxillary bone containing the upper incisor teeth.
B	The Seven Cervical Vertebræ, or bones of the neck.
C	The Eighteen Dorsal Vertebræ, or bones of the back.
D	The Six Lumbar Vertebræ, or bones of the loins.
E	The Five Sacral Vertebræ, or bones of the haunch.
F	The Caudal Vertebræ, or bones of the tail, generally about fifteen.
G	The Scapula, or shoulderblade.

H The Sternum or fore-part of the chest.

I The Costæ or ribs, seven or eight articulating with the sternum, and called the *true ribs*, and ten or eleven united together by cartilage, called the *false ribs*.

J The Humerus, or bone of the arm.

K The Radius, or bone of the fore-arm.

L The Ulna, or elbow. The point of the elbow is called the Olecranon.

M The Carpus or knee, consisting of seven bones.

N The metacarpal bones. The larger metacarpal or cannon or shank in front, and the smaller metacarpal or splent bone behind.

g The fore pastern and foot, consisting of the Os Suffraginis, or the upper and larger pastern bone, with the sessamoid bones behind, articulating with the cannon and greater pastern; the Os Coronæ, or lesser pastern; the Os Pedis or coffin bone; and the Os Naviculare, or navicular, or shuttle-bone, not seen, and articulating with the smaller pastern and coffin bones.

h The corresponding bones of the hind-feet.

O The Haunch, consisting of three portions, the Ilium, the Ischium, and the Pubis.

P The Femur or thigh.

Q The stifle joint with the Patella.

R The Tibia or proper leg bone—behind is a small bone called the fibula.

S The Tarsus or hock, composed of six bones. The prominent part is the Os Calcis, or point of the hock.

T The Metatarsals of the hind leg.

Beautiful as is the horse, and identified so much with our pleasure and our profit, he has been the object of almost universal regard; and there are few persons who do not pretend to be somewhat competent judges of his form, qualities, and worth. From the nobleman with his numerous and valuable stud, to the meanest helper in the stable, and not excluding even the mechanic who scarcely crosses, or sits behind a horse once in a twelvemonth, there is scarcely a man who would not be offended if he were thought altogether ignorant of horse-flesh. There is no subject on which he is so positive, there is no subject on which, generally speaking, he is so deficient, and there are few horses, on some points of which these pretended and self-sufficient judges would not give a totally opposite opinion.

The truth is, that this supposed knowledge is rarely founded on principle—or is the result of the slightest acquaintance with the actual structure of this animal, or that form and connexion of parts on which strength, or fleetness, or stoutness, must necessarily depend. If we were constructing or examining a machine composed of levers and pullies, and by which we purposed to raise a great weight, or to set in motion certain bodies with a given velocity, we should fail in our object, or expose our ignorance of the matter, if we were not aware what kind of lever or connexion of levers was necessary, and in what situation the ropes should be placed, and in what direction the force should be applied, and by what means we could obtain mechanical advantage, and by what peculiar construction it would inevitably be lost.

Now the structure of the horse, like that of the human being*, consists of numerous levers in the shape of bones, with ropes attached to them in the form of muscles and tendons; and these levers are differently connected, and act in different directions; and he will be the best judge of horses who, while he has loved, and lived among them, is somewhat acquainted with the circumstances in which mechanical power is gained or lost.

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* See Treatise on "*Animal Mechanics*."

In speaking then of the structure of this animal, and the points which guide the opinion of real judges of him, we shall, as briefly and as simply as we are able, explain those fundamental principles on which his usefulness and beauty must depend. We require one kind of horse for slow and heavy draught, and another for lighter and quicker work:—one as a pleasant and safe roadster; another with more speed and equal continuance as a hunter; and another still is wanted for the race-course. What is the peculiarity of structure—what are the particular points that will fit each for his proper business, and, to a certain degree, unfit him for everything else? The farmer will require a horse of *all work,* that can carry him to market and take him round his farm, on which he can occasionally ride for pleasure, and which he must sometimes degrade to the dung-cart or the harrow. What combination of powers will enable the animal to discharge most of these duties well, and all of them to a certain extent profitably?

Much time spent among horses, an acquired love of them, and a little, sometimes possibly, too dearly-bought experience, may give the agriculturist some insight into these matters. We will try whether we cannot assist him in this affair; whether we cannot explain to him the reason why certain points must be good, and why a horse without them must, of necessity, be good for nothing. Perhaps some useful rules may thus be more deeply impressed upon his memory, or some common, but dangerous prejudices may be discarded, and a considerable degree of error, disappointment, and expense avoided.

It is first of all necessary to give a sketch of the Anatomy of the Horse, in which we shall endeavour to elucidate those numerous and beautiful instances of wise and benevolent design, exhibited in the structure of this valuable animal, and which will render our study of him more interesting; while many a hint of practical utility will be gained.

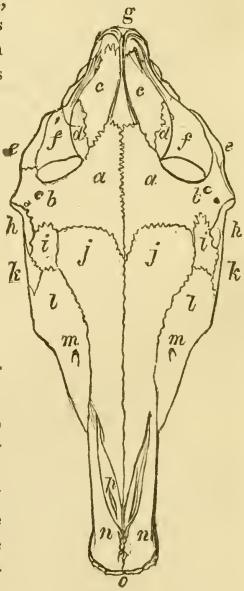
If we treat of this at considerable length, let it be remembered, that the horse is our noblest servant, and that, in describing the structure and economy of his frame, we are, in a great measure, describing that of other domestic quadrupeds, and shall hereafter have to speak only of points of difference required by the different services and uses for which they were destined. And further, let it be remembered that it is only by being well acquainted with the structure and anatomy of the horse that we can appreciate his shape and uses, or understand the different diseases to which he is liable. We trust the reader who may fancy us rather prolix on this head will, before the work is finished, feel the full value of what we purpose to explain. It is from want of knowledge of the anatomy of the horse, that much of the mass of ignorance and prejudice which exists, as to the diseases, &c. to which the horse is subject, is to be referred; and we deem it one of the most important objects of this treatise to reform this ignorance, and remove these prejudices.

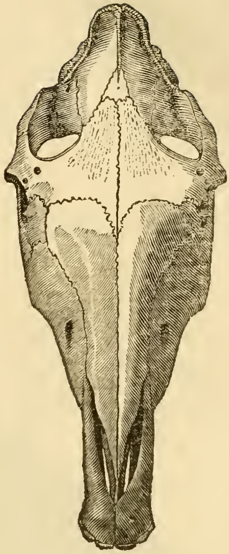
It will be proper here, once for all, to caution the reader, who has hitherto been unaccustomed to reading books of science, against being deterred by the sight of a few of what are termed *hard names.* The fact is, that science must have, to a certain extent, a new language to express minutely and accurately the particular parts or things to be described; and this is the case with every trade, and every art. A carpenter could not without this describe with precision and clearness the different tools in use, nor could he describe the different operations to be performed, without inventing a particular language adapted to his purpose, and whereby he is enabled to express in one word what would otherwise only be accomplished by a long sentence. It is the same with anatomy, except that the names and signs have principally been adopted from the *Latin* and *Greek*, inasmuch as those languages are usually known to scientific men in all countries. This new language becomes one common to all men pursuing the same science. We shall as we go on explain the meaning of the words so adopted, and a very little attention will enable the reader to master them, and it will require little thought to be convinced of the advantage, in respect of clearness and certainty, derived from their use.

We begin with the head, containing the brain and the most important organs of sense.

The head may be divided into two parts, the skull and the face. The bones which compose the skull or *cranium*, and which contain and protect the brain are nine in number: two frontal, *a a*,—two parietal, *c c*,—two temporal, *d d*,—the occipital, *g*,—the ethmoid, and the sphenoid. The two latter lie principally at the base of the skull, and are not seen in this cut, but will be found delineated in figs. *k* and *l*, page 68. These nine bones are separate in the foal at an early period of its existence; but soon after the birth they are firmly united together by what anatomists call sutures, and so firm is the union, that a fracture will occur in any other part more readily than over a suture.

a a	The frontal bones, or bones of the forehead.
b b	The supra-orbital foramina or holes above the orbit, through which pass out the nerves and blood-vessels supplying the forehead. The small hole beneath (of which in many horses there are several) receives vessels which dip into and supply the bone.
c c	The parietal bones, or walls of the skull.
d d	The temporal bones, or bones of the temples.
e e	The zygomatic, or yoke-shaped arch.
f f	The temporal fossa, or pit above the eye.
g g	The occipital bone, or bone of the hinder part of the head.
h h	The orbits, containing and defending the eye.
i i	The lachrymal bones, or tear bones.
j j	The nasal bones, or bones of the nose.
k k	The malar, or cheek bones.
l l	The superior maxillary, or that portion of the upper jaw containing the molar teeth or grinders.
m m	The infra-orbital foramen, a hole below the orbit, through which pass branches of nerves and blood-vessels to supply the lower part of the face.
n n	The inferior maxillary, the lower part of the upper jaw bone, a separate bone in quadrupeds, containing the incisor or cutting teeth, and the upper tushes at the point of union between the superior and inferior maxillaries.
o	The upper incisor or cutting teeth.
p	The openings into the nose, with the bones forming the roof of the palate.





There is an evident intention in this division of the head into so many bones. When the fœtus—the unborn foal—first begins to have life, that which afterwards becomes bone, is a mere jelly-like substance; this is gradually changed into a harder material—cartilage; and, before the birth of the animal, much of the cartilage is taken away by vessels called absorbents, and bone deposited in its stead. In flat bones, like those of the head, this deposit takes place in the centre, and rays or radiations of bone extend thence in every direction. Then, by having so many bones, there are so many centres of radiation; and, consequently, the formation of bone is carried on so much the more rapidly, and perfected at the time when the necessities of the animal require it. At the period of birth, however, this process is not completed, but the edges of the bones remain somewhat soft and pliant, and therefore, in parturition, they yield a little and overlap each other, and thus, by rendering the birth more easy, they save the mother much pain, and contribute to the safety of the foal. Without a change in the form of the head, from a compression and yielding of the bone of which it is composed, the animal could not be born.

The first of these bones, or the first pair of them, occupying the broad expanse of the forehead, are called the *frontal bones, a a.* They are united together by a most curious and intricate dove-tailing, to defend from injury the brain which lies beneath the upper part of them. Lower down, and where the cavity of the nose is to be defended, their union is sufficient, but far less complicated. The mechanism is here, as in every part of the frame, and every part of the universe, wisely adjusted to the necessities and wants of the animal.

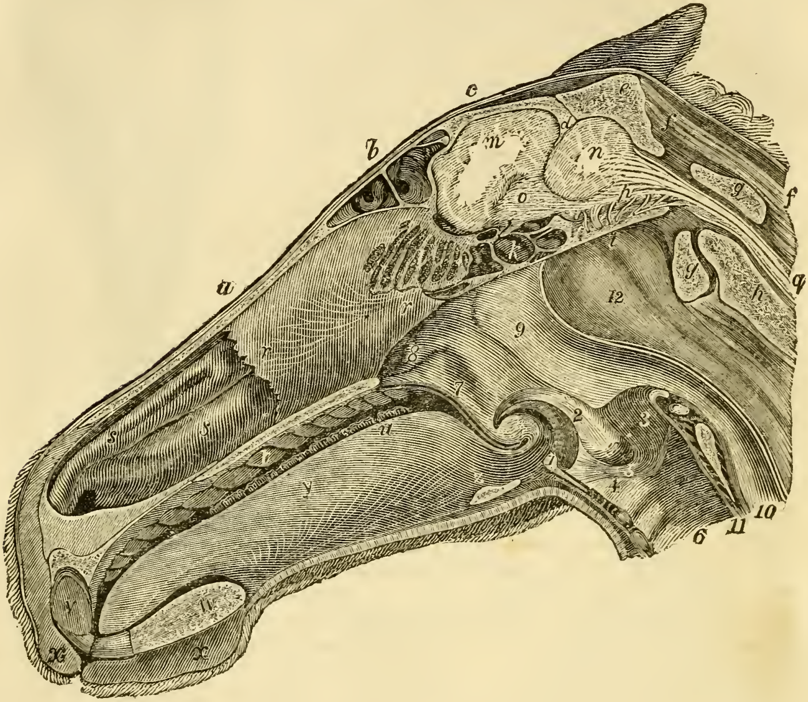
Few things more clearly indicate the breed or blood of the horse than the form of the frontal bones. Who has not remarked the broad angular forehead of the blood horse, giving him that beautiful expression of intelligence and fire, and the face gradually tapering from the forehead to the muzzle; and then compared it with the large face of the cart or dray horse, and the forehead scarcely wider than the face?

At *f*, between the frontal bones, is the pit or cavity above the eye, and by the depth of which we form some idea of the age of the horse. There is placed at the back of the eye, a considerable quantity of fatty substance, on which the eye may revolve easily and without friction. In aged horses, and in diseases attended with general loss of condition, much of this fat disappears; the eye becomes sunken, and the pit above the eye deepens. It is said that some of the lower class of horse-dealers puncture the skin, and, with a tobacco pipe or small tube, blow into the orifice, until the depression is almost filled up. This operation is vulgarly called *puffing the glims*, and, with the aid of a bishopped tooth, will give a false appearance of youth, that will remain during many hours, and may deceive the unwary, though the puffing may easily be detected by pressing on the part.

These bones, however, are not solid, but a considerable portion of them is composed of two plates receding from each other, and leaving numerous and large vacuities or cells. These vacuities are called *the frontal sinuses.*

They communicate with the cavities of the nose, and likewise with those of the sphenoid, ethmoid, and upper jaw bones, and like the windings of a French horn, increase the clearness and loudness of the neighing. They are sufficiently evident at *b* in the following cut.

SECTION OF THE HEAD.



a The nasal bone, or bone of the nose.
b The frontal bone. The cavities or cells beneath are called the frontal sinuses.
c The crest or ridge of the parietal bones.
d The tentorium, or bony separation between the cerebrum and cerebellum.
e The occipital bone.
f The ligament of the neck, or *pack-wax*, by which the head is chiefly supported.
g The atlas, *sustaining* or *carrying*, or first bone of the neck.
h The dentata, *tooth-like*, or second bone of the neck.
i The cuneiform, or *wedge-shaped* process, or base of the occipital bone. Between it and the other portion of the occipital bone *e*, lies the great foramen or aperture through which the prolongation of the brain,—the spinal marrow,—issues from the skull.
k The sphenoid, *wedge-like*, bone with its cavities.
l The ethmoid, *sieve-like* bone with its cells.
m The cerebrum, or brain, with the appearance of its cortical and medullary substance.
n The cerebellum, or little brain, with its beautiful arborescent appearance.
o A portion of the central medullary, *marrow-like*, substance of the brain, and the prolongation of it under the name of the crus cerebri, *leg of the brain*, and from which many of the nerves take their origin.
p The medulla oblongata,—the prolongation of the brain after the medullary substance of the cerebrum and cerebellum have united, and forming the commencement of the

spinal marrow. The columnar appearance of this portion of the brain is represented, and the origins of the respiratory nerves.

q The spinal marrow extending through a canal in the centre of the bones of the neck, back, and loins, to the extremities of the tail, and from which the nerves of feeling and of motion, that supply every part of the frame, except the head, arise.

r The septum narium, or cartilaginous division between the nostrils.

s The same cut off at the lower part, to shew the spongy turbinated, *turban-shaped*, bones, filling the cavity of the nostril.

t The palate.

u The molar teeth, or grinders.

v The inferior maxillary bone, containing the incisor teeth or nippers. The canine tooth, or tush, is concealed by the tongue.

w The posterior maxillary, or lower jaw with its incisors.

x The lips.

y The tongue.

z A portion of the os hyoides, or bone of the tongue, *like a Greek u, υ.*

1 The thyroid, *helmet-shaped*, cartilage, enclosing and shielding the neighbouring parts.

2 The epiglottis, or *covering of the glottis*, or aperture of the wind-pipe.

3 The arytenoid, *funnel-shaped*, cartilages, having between them the aperture leading into the trachea or wind-pipe.

4 One of the chordæ vocales, *cords* or ligaments concerned in the formation *of the voice.*

5 The sacculus laryngis, sac or *ventricle* of the larynx, *throat*, to modulate the voice.

6 The trachea or wind-pipe, with its different rings.

7 The soft palate at the back of the mouth, so constructed as almost to prevent the possibility of vomiting.

8 The opening from the back part of the mouth into the nostril.

9 The cartilage covering the entrance into the eustachian tube, or communication between the mouth and internal part of the ear.

10 The œsophagus, or gullet.

11 The cricoid, *ring-like*, cartilage, below and behind the thyroid.

12 Muscle of the neck, covered by the membrane of the back part of the mouth.

In the sheep, and occasionally in the ox, rarely in the horse, the larvæ of maggots produced by certain species of flies, crawl up the nose, lodge themselves in these sinuses, and produce intolerable pain.

Veterinary surgeons have availed themselves of these sinuses, to detect the existence of glanders, that disease so infectious and so fatal. They may suspect that a horse respecting which they are consulted is glandered. It is of great consequence to be sure about it. The safety of the whole team may depend upon this. It may be a puzzling case. There may be no ulceration of the nose within sight. The glands under the jaw may not be close to, and seemingly sticking to the bone, which is a common symptom, yet for a considerable time there may have been a discharge from the nostril, and the horse is out of condition. On the other hand, some slight ulceration may be detected in the nostril, but the horse eats well, works well, and is in good plight. From the closest examination of the animal, no horseman, and no veterinary surgeon can give a decided opinion.

If, however, the horse be glandered, there will probably be considerable ulceration in the upper part of the cavity of the nose, and a collection of matter there. To detect this the veterinary surgeon sometimes makes an opening into these sinuses. He may do this with perfect safety. On that part of the frontal bone, which lies between the eye and the pit above it, and above the inner corner of the eye, there is, on either side, a small depression or hole (see fig. *b b*, cut, page 66), which may be easily felt in the living horse. It is what anatomists call *a foramen—the supra-orbital* foramen. It gives passage to the blood-vessels and nerves of the forehead.

Suppose a line to be drawn across the forehead, from one of these depressions to the other; on that line, and about half an inch from the centre of it, either on the one side or the other, the frontal sinuses will be found an inch in depth (compare fig. *b*, pp. 66 and 68). There a perforation may be easily and safely made. A little way above, the brain would be endangered, and a little below this line, the cavity of the nose would be pierced. Some warm water may then be thrown into this hole, with a common squirt, and it will run out at the nose. If there be *matter* in the frontal sinuses, or any part of the cavity of the nose, it will appear mixed with the water, and the owner may be assured that the horse is glandered; but if the water flow uncoloured, or simply mixed with blood or mucus, the horse may be considered as free from this disease. The thicky creamy consistence of pus, its sinking in water, and its capability of being perfectly, although not readily mixed with water, will distinguish it sufficiently from the natural running of the nose, which is ropy, lighter than water, and when mixed with it still preserves a kind of stringiness. And this is one of the surest modes of distinguishing between the matter and the natural running of the nose.

The inner plate of the frontal bone forms a considerable proportion of the roof of the cavity which contains the brain (*m* in the last cut). The bones immediately above the frontal, and extending from the frontal to the poll, are called the *parietals*, (*c c*, pp. 66 and 68,) from the Latin word *paries*, a wall. They are two, united together by a suture when the animal is young, but that suture soon becoming obliterated. They have the *occipital*, *g*, p. 66, above, the *frontals*, *a a*, below, and the *temporals*, *d d*, on either side. They are of a closer and harder texture than the frontals, because they are more exposed to injury, and more concerned in defending the brain.

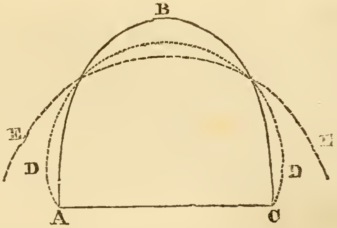
A very small portion only of the *parietals* is naked, and that is composed of bone even harder than the other part, and with an additional layer of bone rising in the form of a crest or ridge externally. Every other part of these bones is covered by a thick mass of muscle, the *temporal* muscle, which is principally concerned in chewing the food, but which likewise by its yielding resistance speedily and effectually breaks the force of the most violent stroke. A blow on the calf of the leg is comparatively disregarded, while one, half as heavy, received on the shin, gives excessive pain. A wool-pack hung over the wall of a fortress, when the enemy is battering to effect a breach, renders the heaviest artillery almost harmless. So the yielding resistance of the *temporal* muscle affords a sure defence to the brain, however sudden or violent may be the blow which falls on the parietal. These benevolent provisions will not be disregarded by the reflecting mind.

On the side of the head, and under the parietals, are placed (*d d*, p. 66) the *temporal bones*, one on each side. These again are divided into two parts, or consist of two distinct bones; the *petrous* portion, so called from its great or *stony* hardness, and containing the wonderful mechanism of the ear, and the *squamous* portion from the appearance of its union with the parietal, overlapping it like a great *scale*.

From the latter there projects a portion of bone, *e*, which unites with the frontal, and forms a strong arch distinctly to be felt at the side of the head immediately above the eye. This arch is designed to protect the upper part of the lower jaw, the motion of which may very plainly be seen beneath it when the horse is eating. It is very strong, and it ought to be, lest the motion should by accident be impeded, and the horse should starve. If only one species of violence were considered to which this arch is too frequently exposed, it would require to possess no common strength; we mean, the brutal manner in which the collar is forced over the head. At the base of the arch is an important cavity not visible in our cut, receiving into it, and forming a joint with the head of the lower jaw—we shall have to speak of it presently.

Having reached the base of the temporal bone, we find it united to the parietal, not by a simple suture, as the lower part of the frontals, or the bones of the nose (see fig. *a* and *j*, p. 66), nor by a dove-tailed suture, as the upper part of the frontals (see the same cut), but it is spread over the parietal in the form of a large scale, and hence, as before observed, called the *squamous* portion of the temporal bone. In fact, there are two plates of bone instead of one. Was there design in this? Yes, evidently so. In the first place, to increase the strength of the base of the *zygomatic* arch. This extensive union between the temporal and parietal bones answers to the buttress or mass of masonry attached to the base of every arch to counteract its lateral pressure. The concussion likewise which might be communicated by a blow on the top of the arch, is thus spread over a large surface, and consequently weakened and rendered comparatively harmless; and that surface is composed of the union of two bones of dissimilar construction. The hard *stony* structure of the parietal is very different from the tougher material of the temporal; and thus, as a finger acts on a sounding glass, the vibration communicated to the temporal is at once stopped, and the brain receives no injury.

But there is yet more admirable design. Where is this *squamous* portion of the temporal bone situated? On the side of the head. And what is the figure of the cranium or skull, and principally that part of it which contains the cerebrum or brain? It is an elliptical or oval arch (see fig. *m*, *n*, *o*, p. 68). If pressure be made on the crown of that arch—if a blow be received on the suture between the parietals sufficient to cause the elastic materials of which the skull is composed to yield—the seat of danger and injury is at the side. If a man receive a violent blow on the crown or back part of the head, the fracture, if there be any, is generally about the temple, and the extravasation of blood is oftenest found there. The following figure will explain this:



Let the line A B C represent an elliptical arch, composed of elastic materials. Some force shall be applied at B sufficient to cause it to yield. We cannot compress it into smaller compass, but just in proportion as it yields at B, will it spur or bulge out at D, and give way sometimes as represented at E. In a dome the weight of the materials constantly acting may be considered as representing the force applied at B; and so great is the lateral pressure, or tendency to bulge out (*vide* D and E), that it is necessary either to dove-tail the materials into one another, or to pass strong iron chains round them. For want of sufficient attention to this, " the dome of St. Sophia in Constantinople, built in the time of the Emperor Justinian, fell three times during its erection; and the dome of the cathedral of Florence stood unfinished an hundred and twenty years for want of an architect."

Nature, in the construction of the horse's head, has taken away the pressure, or removed the probability of injury, by giving an additional layer of bone, or a mass of muscle, where alone there was danger, and has dovetailed all the materials, and, to make assurance doubly sure, has placed this effectual girder at the base, in the overlapping of the squamous portion of the temporal bone.

In the ox, where, to give a secure base to the horn, the frontal bone spreads over the whole of the fore-part of the head, and the cranial cavity is sufficiently secured by the beautiful mechanism between the two plates of that bone, the temporal bone does not overlap the parietal. Nature gives every thing essential to the protection and welfare of the animal, but nothing superfluous.

Above the *parietals*, and separated from them by a suture (fig. *g*, pp. 66 and 68, and fig. *c*, p. 66), is the *occipital* bone. Superiorly it covers and protects the smaller portion of the brain, the cerebellum; and as it there constitutes the summit or crest of the head, and is not protected by muscles, and particularly exposed to danger, it is interesting to see what thickness it assumes. The head of the horse does not, like that of the human being, ride upright on the neck, with all its weight supported by the spinal column, and the only office of the muscles of the neck being to move the head, forward, or backward, or horizontally on its pivot; but it hangs in a slanting position from the extremity of the neck, and the neck itself projects a considerable distance from the chest, and thus the whole weight of the head and neck are suspended from the chest, and require very great power to support them. In addition to the simple weight of the head and neck, the neck projecting from the chest, and the head hanging from the extremity of the neck, act with enormous mechanical force, and increase more than a hundred-fold the power necessary to support them.

It requires a strong man to lift a small table from the ground at arm's length. The farmer's steelyards shew that a weight of a few pounds, at the extremity, will counterbalance or act with a force equal to a hundred weight near the hook or centre.

The head and neck of the horse, and particularly of some horses of a coarse breed, are of no little bulk and weight. We shall hereafter have to show in what breeds, and for what purposes a light or heavy head and neck are advantageous; but it may be safely affirmed, that, projecting so far from the chest, and being consequently at so great a distance from the fulcrum or support, the lightest head will act or bear upon the joint between the last bone of the neck and the first rib, with a force equal to many thousand pounds.

How is this weight to be supported? Is the power of muscle equal to the task? The muscles of the animal frame can act for a certain time with extraordinary force; but as the exertion of this power is attended with the consumption of vital energy, the period soon arrives when their action is remitted or altogether suspended.

Muscular power is altogether inadequate to the constant support of the head of the horse. A provision, however, is made for the purpose, simple and complete.

From the back of the occipital bone (fig. *f*, p. 68), and immediately below the crest, proceeds a round cord of considerable bulk, and composed of a ligamentous substance, and which is carried down and securely attached to the spines of the vertebræ, or bones of the back; and by this ligament (the *ligamentum colli*, ligament of the neck, commonly called the *pack-wax*) the head is supported.

There are, however, some admirable contrivances connected with this ligament. As it proceeds from the head, it is in the form of a round cord. It passes over the *atlas*, or first bone of the neck, without touching it, and then attaching itself strongly to the second bone, principally supports the head by its union with this bone. The mechanical disadvantage is increased, but the head is turned more freely on the first and second bones. The principal stress is on the *dentata* or second bone, so much so, that, in poll-evil, this ligament may be divided without serious inconvenience to the horse. It then suddenly sinks deeper, and communicates with all the other vertebræ. Each of these communications becomes a separate point of support, and as they approach nearer to the prop, or centre of motion, the mechanical disadvantage, or the force with which the weight of the head and neck presses and acts, is materially lessened.

The head then, without any aid from muscular energy, is, while the animal is in a state of rest, supported by this ligament.

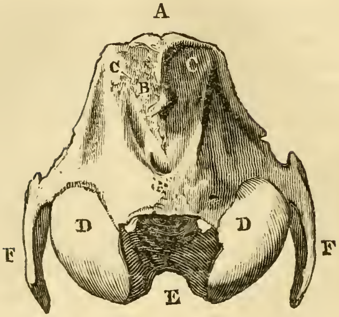
There is, however, something yet wanting. The head must not be always elevated. The horse has his food to seek. In a state of nature this food lies principally on the ground, and the head must be lowered to enable the animal to get at it. How is this effected? This ligament, as we call it, because it resembles in appearance the other ligaments of the body, possesses a property which they have not, and which they must not have, or they would be useless. No well-knit joint could exist if it had this property. The pack-wax is *elastic*. It will yield to a force impressed upon it, and it will resume its natural dimensions when that force is removed. It sustains perfectly the weight of the head. That portion of tenacity or strength is given to it, which will not yield to the simple weight of the head, but which will yield to a very little additional weight. Its resisting power is so admirably adjusted to that which it has to sustain, that when certain muscles, whose action is to depress or lower the head, begin to act, and add their power to the previous weight it had to bear, the ligament stretches, and when the horse is browsing, it is full two inches longer than when the head is erect.

When the animal has satified himself, these depressing muscles cease to act, and other muscles, which are designed to assist in raising the head, begin to exert themselves; and, by their aid (but more by the inherent elasticity of the ligament), the head is once more elevated, and remains so without the slightest exertion of muscular power. This is one of the many applications of the principle of elasticity which we shall have to observe and admire in the construction of the animal frame.

The ligament of the neck is inserted into the centre of the back part of the occipital bone, and immediately below the vertex or crest of that bone; and, therefore, the bone is so thick at this part (see fig. *e*, p. 68).

Many, and large, and powerful muscles, however, are necessary to turn the head in various directions, and to assist in raising it when depressed. The occipital bone, as will be seen in this cut, presents a spine running down the centre, B, and a large roughened surface for the attachment of these muscles C, C.

Lower down, and still at the back of the occipital bone, are two rounded



protuberances D, D, by which the head is connected with the *atlas*, or upper, or first vertebra, or bone of the neck, and these are called the *condyloid*, cup-shaped, processes of the occipital bone. All the motions of the head are partly and many of them wholly performed by this joint.

Between them is a large hole, called the *foramen magnum*, or great aperture, E, through which the continuation of the brain, called the spinal cord or marrow, passes out of the skull.

As an additional contrivance to support the great weight of the head, are two other projections of the occipital bone, peculiar to animals whose heads are set on in a slanting direction, and into which powerful muscles are inserted; they are called the *coracoid*, beak-like, processes or prolongations F, F, of the occipital bone.

Running forward, and forming outwardly a part of the base, and inwardly a portion of the floor of the skull, is what from its wedge-like shape is called the *cuneiform* process of the occipital bone (fig. *i*, p. 68). It is thick, strong, and solid; and placed at the bottom of the skull, not only to be a proper foundation for, and to give additional strength to the arch on each side, but speedily to break and stop all vibration and concussion.

At the base of the skull, and anterior to, or below the *occipital*, lies the *sphenoid*, wedge-like bone (fig. *k*, p. 68). Its body, likewise called the *cuneiform*, or wedge-shaped process, is a continuation of the same process of the occipital, and like it is thick and solid, and for the same important purpose. This bone branches out into four irregular bodies or plates, two of which are called the *wings*, and two running to the palate, the legs. They could not be represented in the cut, and there is nothing important belonging to them so far as our work is concerned. Internally (fig. *k*), the sphenoid forms a portion of the cavity of the skull.

Of the *ethmoid*, sieve-like, bone little can be seen outwardly. A small portion is found in the back part of the orbit, and in the cavity of the cranium; but the most important part of it is that which is composed of a great number of thin plates, forming numerous cavities or cells (fig. *l*, p. 68) lined with the membrane of the nose, and entering into the cavity of the nose. The upper portion is called the cribriform, or sieve-shaped plate, from its being perforated by a multitude of little holes, through which the nerve connected with smelling passes and spreads over the nose.

Altogether these bones form a cavity of an irregular oval shape, but the tentorium penetrating into it, gives it the appearance of being divided into two (*d*, p. 68).

The cavity of the cranium may be said to be arched all round. The builder knows the strength which is connected with the form of the arch.

If properly constructed, it is equal to a solid mass of masonry. The arch of the horse's skull has not much weight to support, but it is exposed to many injuries from the brutality of those by whom he should be protected, and from accidental causes.

The roof of the skull is composed of two plates of bone: the outer hard and tough, and the different parts dove-tailed together, so as not to be easily fractured; the inner plate is elastic, and by the union of these two substances of different construction, the vibration is partly damped or destroyed. By means of the elasticity of the inner plate, the force or influence which might reach it through the outer plate, and, notwithstanding its difference of structure, affect it, is spread over the whole of the roof; and the inner plate is not dove-tailed like the outer, because the dove-tailing would impede the spread of the vibration.

The brain of the horse corresponds with the cavity in which it is placed (*m*, p. 68). It is a flattened oval. It is divided into two parts, one much larger than the other, the *cerebrum* or brain, and the *cerebellum* or little brain (*n*, p. 68). In the human being the cerebrum is above the cerebellum, in the quadruped below; and yet in both they retain the same relative situation. The cerebellum is nearer to the foramen or hole, through which the brain passes out of the skull (*n*, p. 68), and the continuation of the cerebrum passes under the cerebellum (*p*, p. 68) to arrive at this foramen. In the human head this foramen is at the base of the skull; but in the quadruped, in whom the head is placed slanting, it is necessarily elevated.

It would occupy too great a portion of our time fully to consider the wonderful and mysterious functions discharged by the brain, but some diseases to which the horse is subject, and a very useful operation, the division of the nerve of the leg, for foot lameness, could not be understood without a slight account of this important organ.

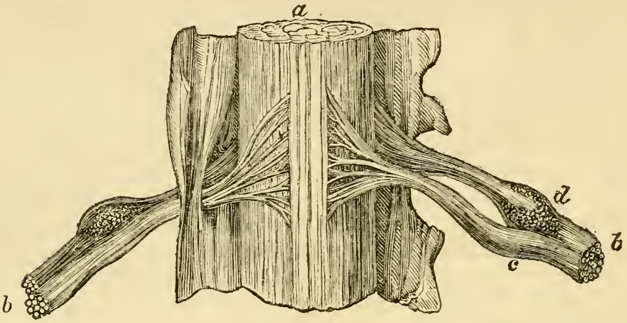
When the brain is cut it presents two distinct substances (*m*, p. 68), one principally on the outside, grey, or ash-coloured, and therefore called the *cortical* (bark-like, or rind-like) from its situation, or the *cineritious* (ash-like), from its colour; and one more in the centre, and its fibres running towards the centre, and white and pulpy, and from its consistence called the *medullary* (marrow-like) part. This latter portion seems to be collected and condensed towards the centre or base of the brain, and all the nerves derive their origin from it.

The *medullary* portion then is evidently connected with the nervous system; and the nerves are concerned in the discharge of all the offices of life. They give motion to the limbs; they supply with energy the heart, the lungs, the stomach, and every part connected with life; and being the medium through which sensation is conveyed, they supply the mind with materials to think and work upon.

The *cineritious* part has a different appearance, and is evidently differently constituted; and some have supposed it to be the residence of the mind, receiving the impressions which are conveyed to the brain by the nerve of sensation, and directing the operation and action of those which give motion to the limbs. In accordance with this it happens, that where superior intelligence is found, the cineritious prevails, and where little beside brutal strength and appetite exist, the medullary portion is enlarged.

From the medullary substance proceed certain cords or prolongations, called nerves, by which the animal is enabled to receive impressions from surrounding objects, and to connect himself with them, and to possess many pleasurable or painful sensations. One is spread over the membrane of the nose, and gives the sense of smell; another expands on the back of the eye, and the faculty of sight is gained; and a third goes to the internal structure of the ear, and the animal hears. Other nerves proceeding to different parts of the head give the faculty of motion to those parts; and another class bestows the power of feeling.

One division of nerves (*h*, p. 68) springing from a prolongation of the brain, and yet within the skull, wander to different parts of the frame, for important purposes connected with respiration or breathing, and as the act of breathing is essential to life, and were it to cease, the animal would die—these are nerves of *involuntary* motion; so that whether he is awake or asleep, conscious of it or not, the lungs heave and life is supported. Lastly, from the spinal cord *q*, (a further prolongation of the brain, and running through a cavity in the bones of the neck, back, and loins, and extending to the very tip of the tail,) other nerves are given off at certain intervals. This cut delineates one pair of them. The spinal cord *a*, is combined of six distinct columns or rods, running through its whole length—three on either side. The two upper columns (the portion of spinal marrow represented in our cut, is supposed to be placed with its inner or lower surface toward us) proceed from those tracks of the brain devoted to sensation. From these come out abruptly distinct fibres from the column, and which collect together, and passing through a little ganglion or enlargement, *d*, (an enlargement of a nervous cord is called a ganglion), become a nerve of sensation. From the lower or inner side, (a prolongation of the track devoted to motion,) proceed other fibres, which also collect gradually together, and form a nervous cord, *c*, giving the power of motion. Beyond the ganglion the two unite, and form a perfect spinal nerve, *b*, possessing the power both of sensation and motion; and the fibres of the two columns proceed to their destination, enveloped in the same sheath, and apparently one nerve. Each portion, however, continues to be wrapped in its own membrane. They are united, yet distinct; they constitute one nerve, yet neither their substance nor their office is confounded. Our cut, closely examined, *b*, will give some idea of the manner in which these distinct fibres are continued;—each covered in its own membrane, but all enveloped in a common covering.



All these nerves are organs of sensation and motion alone; but there are others whose origin seems to be outside of and below the brain. These are the *sympathetic*, so called from their union and sympathy with all the others, and identified with life itself. They proceed from a small ganglion or enlargement in the upper part of the neck, or from a collection of little ganglions in the belly. They go to the heart, and it beats, and to the stomach, and it digests. They form a net-work round each blood-vessel, and the current flows on. They surround the very minutest vessels, and the frame is nourished and built up. They are destitute of sensation, and they are perfectly beyond the control of the will.

The reader, we trust, will now comprehend this wonderful, yet simple machinery, and be able, by and by, to refer to it the explanation of several diseases, and particularly of the operation to which we have referred.

Two of the senses have their residence in the bones of the cranium, those of hearing and sight.

They who know any thing of the horse pay much attention to the size, setting on, and motion of the ear. Ears rather small than large, placed not too far apart, and erect, and quick in motion, indicate both breeding and spirit; and if a horse is frequently in the habit of carrying one ear forward, and the other backward, and especially if he does so on a journey, he will generally possess both spirit and continuance. The stretching of the ears in contrary directions shews that he is attentive to every thing that is taking place around him, and, while he is doing this, he cannot be much fatigued, or likely soon to become so. It has been remarked that few horses sleep without pointing one ear forward and the other backward, that they may receive notice of the approach of objects in every direction *.

The ear of the horse is one of the most beautiful parts about him, and by few things is the temper more surely indicated than by its motion. The ear is more intelligible even than the eye, and a person accustomed to the horse, and an observer of the horse, can tell by the expressive motion of the ears almost all that he thinks or means. It is a common saying that when a horse lays his ears flat back upon his neck, and keeps them so, he most assuredly is meditating mischief, and the stander by should beware of his heels or his teeth. In play, the ears will be laid back, but not so decidedly, nor so long. A quick change in their position, and more particularly the expression of the eye at the time, will distinguish between playfulness and vice.

The external ear is formed by a cartilage of an oval or cone-like shape, flexible, yet firm, and terminating in a point. It has, directed towards the side, yet somewhat pointing forward, a large opening extending from the top to the bottom. The intention of this is to collect the sound, and convey it to the interior part of the ear.

The hearing of the horse is remarkably acute. A thousand vibrations of the air, too slight to make any impression on the human ear, are readily perceived by him. It is well known to every hunting-man, that the cry of the hounds will be recognised by the horse, and his ears will be erect, and he will be all spirit and impatience, a considerable time before the rider is conscious of the least sound. Need anything more be said to expose the absurdity of *cropping?* Fortunately for this too-often-abused animal, cropping is not now the fashion. Some thoughtless or unfeeling young men endeavoured, a little while ago, to introduce it, but the voice of reason and humanity prevailed.

This cartilage, the *conch* or shell, is attached to the head by ligaments, and sustained by muscles, on which its action depends. It rests upon another cartilage, round without, and irregular within, called the *annular*, ring-like, cartilage, and conducting to the interior of the ear; and it is

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[*] "When horses or mules march in company at night, those in front direct their ears forwards; those in the rear direct them backward; and those in the centre turn them laterally or across; the whole troop seeming thus to be actuated by one feeling, which watches the general safety."—ARNOTT's *Elements of Physics*, vol. i. p. 478.

likewise supported and moved by a third small cartilage, placed at the fore part of the base of the conch, and into which several muscles are inserted.

The ear is covered by skin thinner than in most other parts of the body, and altogether destitute of fat, that it may not be too bulky and heavy, and may be more easily moved. Under the skin lining the inside of the cartilage are numerous glands, that secrete, or throw out a scaly white greasy matter, which may be rubbed off with the finger, and which is destined to supple this part of the ear, and to keep it soft and smooth. Below this are other glands which pour out a peculiar, sticky, bitter fluid, the wax, probably displeasing to insects, and therefore deterring them from crawling down the ear, and annoying the animal: or by its stickiness arresting their progress.

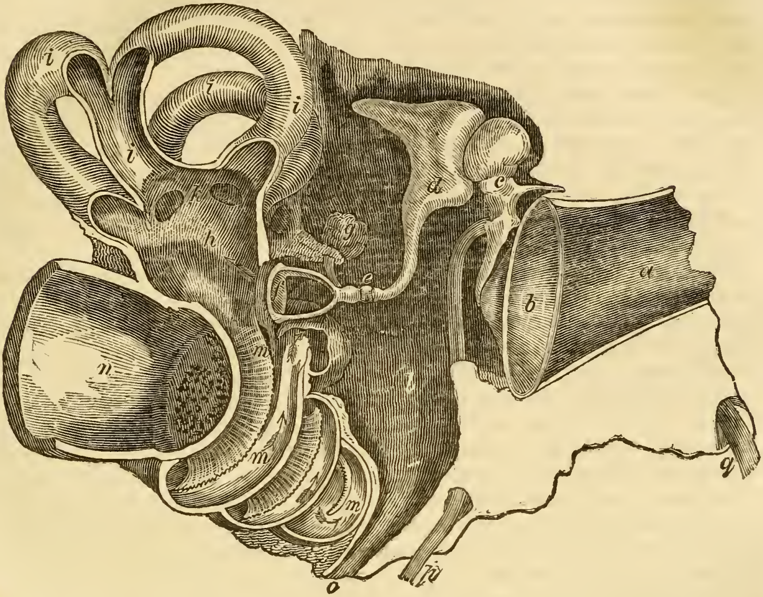
The internal part of the conch is covered with long hair which stands across the passage in every direction. This likewise is to protect the ear from insects, that would with difficulty penetrate through this thick defence. The cold air is likewise prevented from reaching the interior of the ear, and the sound is moderated, not arrested; penetrating readily but not violently; and not striking injuriously on the membrane covering the drum of the ear. Can these purposes be accomplished, when it is the custom of so many carters and grooms to cut out the hair of the ear so closely and industriously as they do? The groom who singes it to the root with a candle must be either very ignorant or very brutal. It can scarcely be accomplished without singeing the ear as well as the hair. Many a troublesome sore is occasioned by it; and many a horse that was perfectly quiet before, rendered difficult to handle or to halter; and even disposed to be otherwise vicious from a recollection of the pain which he suffered during the absurd and barbarous operation.

The sound collected by the outer ear, passes through the lower or *annular*, ring-shaped, *cartilage*, and through irregularities, which, while they break and modify it, carry it on to another canal, partly cartilaginous, and partly bony, conducting immediately to the internal mechanism of the ear. This canal or passage, is called the external auditory passage, *a;* and at the base of it is placed, stretching across it, and closing it, a thick and elastic membrane, called the membrane of the drum, *b*. This membrane is supplied with numerous fibres, from the fifth pair, or sensitive nerve of the head, for it is necessary that it should possess extreme sensibility.

The mechanism of the ear is so exquisite that we cannot refrain from entering into a minute description of it, although we feel that we are somewhat trenching on the comprehensive subject of animal physiology.

Sound is produced by certain vibrations or undulations communicated to the air, by the concussions or tremblings of things around, and which vibrations spread through the air, and fall upon the ear. The striking of a glass, and the sound of a large bell, are sufficient illustrations of the manner in which sound is propagated by distinct vibrations or waves of the air. These vibrations reach the conch of the ear. From its hollow form and peculiar shape, and the faculty of being directed to every quarter whence the vibrations proceed, they are collected, and condensed, and conveyed down the outer passage, and fall upon the membrane, *b*. That membrane, tightly stretched, and elastic, receives the impression made upon it, and vibrates in perfect unison.

This membrane covers the entrance into a cavity, called the *tympanum* or *drum* of the ear, *l*, from its supposed resemblance to a drum. It is of an irregular shape. The walls or sides are composed of bone, lined with a delicate membrane, with several apertures or holes, *b*, *f*, *k*, the principal of which we shall describe.



EXPLANATION OF THE CUT OF THE EAR.

a The *meatus externus*, or outer passage.
b The *membrana tympani*, or membrane stretched over the entrance to the drum of the ear.
c The *malleus*, or hammer, the first of the *ossiculi* (little bones), and resting upon the membrana tympani.
d The *incus*, or anvil.
e The *orbiculare*, or round bone.
f The *stapes* or stirrup bone, resting on the membrane which covers the *foramen ovale*, or oval window, and which conducts to the labyrinth of the ear.
g One of the muscles of the tympanum attached to the stapes.
h The *vestibule*, or hall, the first portion of the labyrinth of the ear.
i The *semicircular canals.*
k Openings into the canals.
l The *tympanum*, or drum of the ear.
m The cochlea, or shell-like portion of the labyrinth.
n The *meatus auditorius internus*, or internal passage, through which both divisions of the seventh pair of nerves enter the ear. At the end of it is the cribriform sieve-like plate, through which the *portio mollis*, or soft portion of the seventh pair of nerves, and which is the auditory nerve, or nerve of hearing, enters to spread over the cochlea and vestibule.
o The *Eustachian tube*, or communication between the tympanum and the mouth, so called from its discoverer.
The cord, or nerve of the ear, *corda tympani*, a branch of the *portio dura*, hard portion, of the seventh pair of nerves, united to a portion of the fifth pair, running across the tympanum, and ramifying on it and on the membrane.
q The exit of the *portio dura* from the temporal bone, to spread over the face.

Between the membrane at which we have arrived, *b*, and a smaller one almost opposite, *f*, leading to the still interior part of the ear, and on which the nerve of hearing is expanded, are four little bones, *c*, *d*, *e*, *f*, united to these membranes, and to each other. Their office is to convey, more perfectly than it could be done through the air of the cavity, the vibrations which have reached the membrana tympani.

The first of these little bones (*ossiculi*) is called the *malleus*, *c*, from its supposed resemblance to a hammer. The longer arm of the hammer is attached to the edge of the membrane, and reaches to its centre, and is so strongly united to it, as to draw it down into a kind of funnel-shape. It is the bracing of the parchment of the soldier's drum; and it must be sufficiently evident, that every vibration given to the membrane must be communicated to the hammer-bone.

From the hammer, the vibration is communicated to the *incus*, *d*, so named from its imagined likeness to a blacksmith's anvil, although it is a great deal more like a molar tooth or grinder, with two fangs, and one of them much lengthened and curved. The hammer, however, is so formed and placed, that the impression or vibration is not merely conveyed, but considerably increased. Between the extremity of the handle of the hammer, and its head resting on the anvil, is a sharp process, received into a hollow in the bony wall of the drum, and which is evidently the fulcrum, or centre of motion, on which the hammer turns; and this is much nearer the head of the bone, than the extremity of the handle. It is then a lever, and it acts upon the principle of the lever. The point of the handle is the place where the vibration is received, or the power applied; the little process is the fulcrum or prop, or turning point; and the head of the bone is the extremity of the other arm, where the weight is to be hung, or the effect produced. Now, in proportion (as we shall have again and again to demonstrate, when we speak of the construction of the limbs) as the distance of the power from the fulcrum exceeds that of the weight, so will be the mechanical advantage gained, or so will the effect be increased. Here the extremity of the hammer is twice as far from the centre as the head; and, therefore, the effect will be doubled, and the vibration received by the extremity of the handle, will be conveyed with double intensity to the anvil.

The bodies of these bones are elastic; and the heads of all bones are covered by a substance, *cartilage*, elastic in the highest degree: therefore, the impression or vibration communicated from the hammer to the anvil, will not be deadened, but rather increased by the collision of these elastic bodies.

The anvil *d* is another lever, and not only would the vibration be communicated undiminished through its substance, but, one of the projections or fangs being received into an opening in the wall of the drum, and the distance of the point at which the impression was received, or the power resides, being greater from the centre than that where the impression is to be conveyed or given up to the next bone, or, in other words, where the effect is to be produced, mechanical advantage is here, likewise, gained, and the effect on the next bone, *e*, may fairly be reckoned at three times the intensity of the original vibration.

The round bone, *e*, a very minute one, is the next in order. It is the smallest bone in the body; and its use seems to be, to form a more complete and moveable joint between the anvil and the stirrup, and to cause the impulse or vibration to be communicated to the stirrup-bone in a perpendicular direction.

The last of the four little bones, is the *stapes*, or stirrup bone. It closely resembles a stirrup in form, and it is placed on the membrane of the *fenestra ovalis*, the oval window, or opening into the most interior part of the ear, and the immediate and actual seat of hearing. The stirrup being retained in a perpendicular direction on this membrane, by the round bone, not only is the full impression which had been communicated to the first membrane conveyed to the other, but it is trebled by the beautiful mechanism of the bones.

Sound, we have said, is produced by vibrations conveyed to the ear, and exciting similar vibrations in certain parts of the ear. These vibrations, once excited, do not immediately cease. A glass continues to sound, and the prolonged undulations of the deep-toned bell are familiar to every one. The pulses of sound succeed each other with great rapidity. In speaking, the words quickly follow each other, and each syllable produces a separate impulse on the external membrane of the ear. Unless, however, one pulsation or vibration had ceased before the next was communicated, language would be unintelligible, and a confused and endless noise would prevail. The finger placed on the edge of a glass immediately stops the vibration. The damper applied to the piano-forte effects the same purpose, and gives distinctness of sound and tone.

There is in the ear an admirable contrivance to accomplish the same object. Muscles are attached to these little bones, and particularly to the hammer and stirrup, which are in contact with the membranes. One belonging to the stirrup is given in our cut, *g*. They are placed there, according to some physiologists, to tighten or relax the chain of bones, in order to produce greater or less intensity of sound. We would rather say that they were intended as dampers, to prevent the otherwise unavoidable confusion of sound. No sooner is an impression conveyed to these bones, or a vibration communicated down them, than the muscles contract, and by that contraction tighten the chain of bones, and by that tightening, destroy and not increase the vibration. The heads of the bones are pressed one on the other, so that, like the finger on the edge of the glass, the vibration is not only immediately arrested in these bones, but in the membranes above and below to which they are attached.

The air in the drum of the ear is not always of the same warmth. In fever, or in consequence of inflammation in a neighbouring part, or during the excitement of exercise, the air in the drum may attain a degree of heat far above the natural standard; the consequence of which would be that it would expand. All bodies expand with heat; and this air expanding would press on every part of the cavity. The bony walls of the cavity would not yield, but the membrane might be so violently distended, as to be incapable of vibrating. Under the cold fit of fever, the air would collapse, or would diminish in bulk. All bodies contract by the application of cold. Then the external air, endeavouring to enter the partial vacuum, and pressing the membranes inward, might produce precisely the same effect. To prevent all this, and to preserve a proper balance between the heat of the air in the tympanum, and that of the other parts of the body, or the atmosphere, there is a passage communicating with the mouth; and by means of the mouth, with the external air. See *p* in this cut, and 9 in the cut, page 68, which gives the cartilage that covers the entrance of this passage, the *Eustachian tube*, into the mouth.

The Eustachian tube commences in the drum of the ear, by a mere slit in the bony wall, which, passing through the stony portion of the temporal bone, and part of the sphenoid bone, becomes cartilaginous, and then expands, and ends in a large pouch or bag. The cartilage, *p*, protects the mouth of this bag, and prevents the food from entering it; and likewise enables it occasionally to unclose for purposes connected with the faculty of hearing.

The impression, then, has been conveyed by the mechanism of the bones, from the membrane of the drum, *b*, to the membrane on which the stirrup rests, *f*; and which closes the fenestra ovalis, or oval window, or opening into the *labyrinth* of the ear. This mechanism, however, deeply seated as it is in the head, and guarded by the stony hardness of the temporal bone, is liable to injury, and we are next led to admire many provisions, for preserving the sense of hearing, even when much mischief has been done to the machine. The membrane may be punctured or ruptured. It is occasionally so by accident or violence, and lately purposely done in the human subject, to remedy deafness produced by obstruction of the Eustachian tube. The vibrations of the external air would proceed down the passage *a*, and be communicated, although imperfectly, to the little bones at the bottom, *c*, *d*, *e*, and carried on to the oval window, *f*, and hearing would remain. Supposing that the three first of the little bones were diseased or removed, the vibration of the external air would be communicated to the air in the drum, and by that to the stirrup, *f*, and the animal would not be entirely deaf: or even if the whole of the little bones were destroyed, yet the membrane of the oval window remaining, some vibration might be communicated to it, and some sound perceived.

Passing the oval window, *f*, we arrive at the true seat of hearing. A strangely irregular cavity, *h*, presents itself, filled with an aqueous fluid, while the substance or pulp of the *portio mollis* or soft portion of the seventh pair of nerves, the *auditory* nerve, expands on the membrane which lines the walls of this cavity. Why is this cavity filled with a liquid? First, that the membrane which covers the passage into it, might always be preserved in a proper state to receive and communicate vibrations. If the labyrinth had contained a fluid possessed of much expansibility, in the considerable changes of temperature to which the frame is subject, this membrane might be stretched beyond the power of vibrating, and almost to bursting by the increased bulk of that fluid. Air is highly expansible. That is of no consequence in the drum of the ear, *l*, because, as it expanded, it would rush out of the Eustachian tube; but in the labyrinth it would be highly injurious, because that is a closed cavity. These interior chambers then are filled with water instead of air, because it is not one hundredth part so expansible as air. If, however, the labyrinth be completely filled with this aqueous fluid, how can any undulation or vibration take place? Undulation supposes a change of figure, an enlargement in some direction; but there can be no enlargement in a bony cavity completely filled. This was not forgotten in the wonderful construction of the ear, and, therefore, at the base of the shell, *m*, and between the stirrup and the shell, is an opening, covered likewise with membrane, called the round window, or communication between the drum and the labyrinth. When any force, then, is impressed on the membrane under the stirrup, this membrane yields to the impression, and suffers the vibration to be propagated through the whole of the labyrinth. When the vibration ceases, and the fluid is at rest, the membrane over this opening returns to its natural situation, and is ready to yield to the next impression.

There is another important reason why these cavities are filled with aqueous fluid. The principal object of the mechanism of the little bones, we have seen to be, perfectly to convey, and even to increase the effect of, the vibration first communicated to the membrane of the drum. The vibration reaches the oval window, trebled in intensity. The same object is pursued within the labyrinth. A liquid is placed there, because sound is propagated through it, with greater rapidity. While sound travels through air at the rate of 1132 feet in a second, it passes through water at the rate of more than 4000 feet in the same time. The impulse communicated to the water by the membrane, is thus more suddenly spread over the whole of the labyrinth. There is, besides, a law regulating the pressure of fluids, by which this impulse must be spread over the *whole* of the labyrinth, and every portion of the expansion of the nerve will be affected by it, which would not be the case in a fluid so rare and so expansible as air.

The strongest reason, however, remains to be stated,—the impression or vibration is rendered more intense, by travelling through water. That sound which would scarcely be heard in the air, is almost deafening under water. It is a common practice for boys when they bathe, to dive with a stone in each hand, and the rubbing of them together under water produces a rumbling sound of extraordinary loudness. This is contrary to the old opinion; and even philosophers, of no mean repute, have denied that fishes had ears, because they were placed in a medium, through which sound could scarcely be conveyed, and where their ears would be of little use to them. Later and better observers have proved that sound is propagated far more intensely through water, than through air; and therefore, an aqueous fluid occupies those chambers of the ear, on the walls of which the auditory nerve is expanded.

The oval window opens into the labyrinth, which is divided into three compartments. First is the *vestibule*, *h*, the hall of entrance, not more than a quarter of an inch wide in the actual subject, but magnified in our cut, for the purpose of illustration. Over the whole of the membrane by which it is lined, there are spread expansions of the soft portion of the seventh pair of nerves.

On the upper side are several foramina or holes, *k*, which conduct to the *semi-circular canals*, *i*, containing also water, lined by the same membrane, and that membrane likewise covered, although not so thickly, with nervous pulp. The posterior one is a perfectly semi-circular canal, with two openings into the vestibule. The other two run into each other in a part of their course, and have one common opening, and one peculiar to each; so that these canals open into the vestibule by five apertures.

These canals contain a singular mechanism. In the part of the vestibule at the opening of the canals, *k*, is suspended a little bag filled with a very clear fluid, and from which branches go into, and occupy the canals, not filling them, but floating in the fluid which they contain; and on these bags the portion of the nerve belonging to the canal is principally distributed. The membrane composing these bags is exceedingly thin. Thus floating in the fluid of the canals, and richly supplied with nervous matter, the slightest vibration or motion communicated to the fluid, by the stirrup on the oval window, will be immediately and powerfully felt.

On the other side is, if possible, a more complex mechanism. At *m* is the *cochlea*, so termed from its likeness to the convolutions of a shell. It, however, more resembles a spiral lamina, or narrow and thin plate, partly bony, and partly membranous, running round a column in the centre. It is a spiral staircase in a round tower. The base of it rests on the internal passage, *n*, through which both portions of the seventh pair of nerves pass into the ear. Its apex, or top, approaches the Eustachian tube, *o*. The soft, or auditory portion of the nerve, penetrates through the cribriform or sieve-like termination of the passage, and a part of it runs up the central column or bone, which is hollow and spongy, and, through a thousand apertures in it, ramifies on the lamina of bone, twining spirally around the column, and on the membranous fringe which floats in the fluid with which the shell is filled, and the whole is covered by a thick expansion of nervous matter.

The *cribriform* plate extends beyond the base of the shell to the vestibule, and those portions of nerve there enter, which spread over the vestibule and the semi-circular canals; but the principal part of it seems to be given to the cochlea.

What is the distinct and peculiar office of these parts, so curiously and yet so differently constructed, we know not. They are both admirably adapted to render the sense of hearing fully equal to every possible want of the animal. In the horse the cochlea is much larger, compared with the canals, than it is in the ox or sheep; but for what especial purpose we are unable to determine: nor can we account for the large pouch-shaped opening of the Eustachian tube in the horse, (fig. 9, p. 68), nor for the small developement of the mastoid cells in the horse, while they are exceedingly large in the ox. There are many parts of the frame, the precise use or function of which we cannot ascertain; but, as far as we do understand the mechanism of the various animals which pass under our notice, all is fittest and best; and the study of the animal frame, with a view to discover the evidences of design, is pleasing and improving.

The *Eye* is a most important organ, and comes next under consideration, as inclosed in the bones of the skull. The eye of the horse should be large, and somewhat but not too prominent, and the eyelid fine and thin. If the eye be sunk in the head, and *apparently* little (for there is actually a very trifling difference in the size of the eye in animals of the same species and bulk, and the seeming difference arises from the larger or smaller opening between the lids), and the lid be thick, and especially if there be any puckering towards the inner corner of the lids, that eye either is diseased, or has been lately subject to inflammation; and, particularly, if one eye is smaller than the other, it has been, at no great distance of time, inflamed.

The eye of the horse enables us pretty accurately to guess at his temper. If much of the white be seen, the buyer should pause ere he completes his bargain; because, although it may, yet very rarely, happen that the *cornea* or transparent part is unnaturally small, and therefore an unusual portion of the white of the eye is seen, and especially when the horse is looking sideways, or backward, yet experience has shown that this display of white is dangerous. The mischievous horse is slyly on the look out for opportunities to do mischief, and the frequent backward direction of the eye, when the white is most perceptible, is only to give surer effect to the blow which he is about to aim.

We will give a cursory description of the eye, and the uses of its different parts.

The eyes are placed at the side of the head, yet a little pointing forward, to give the animal a more extended field of vision. He needs this in his wild state to detect the approach of his enemies, and it is useful to him when employed in our service.

The eye is supported behind by muscles attached to different parts of the bony orbit, and it is embedded in a vast mass of fat, upon which it may be readily moved, and without friction; and that fat being absorbed in sickness or old age, the eye is retracted and sinks into the orbit.

In front, the eye is supported and covered by the lids, which closing rapidly, protect it from many an injury that threatens;—supply it with that moisture which is necessary to preserve its transparency;—in the momentary act of closing, they give a certain and sufficient respite to a delicate organ, which would otherwise be fatigued and worn out, by the constant glare of day;—when the eye labours under inflammation, defend it from the stimulus of light,—and, gradually drooping, permit the animal to enjoy that repose which nature requires.

Extending round both lids, and, it may be almost said, having neither origin nor insertion, is a muscle called the *orbicularis,* or circular muscle. Its office is to close the lids in the act of winking or otherwise, but only while the animal is awake. When he sleeps, this is effected by another and very ingenious mechanism, for no voluntary muscle will continue in action during sleep. The natural state of the eyelids is that of being closed; and they are kept open by the energy of the muscles, whose office it is to raise the upper lid. As sleep steals upon the animal, these muscles cease to act, and the lids close by the inherent elasticity of the membrane of which they are composed.

The skin of the lid is, like that of the ear, exceedingly fine, to prevent unnecessary weight and pressure on such a part, and to give more easy and extensive motion. The lids close accurately when drawn over the eye, and this is effected by a little strip of cartilage, at the edge of each of them, which may be easily felt with the finger, and which preserves them in a hoop-like form, and adapts them closely to the eye and to each other. The lower cartilage, however, does not, as a moment's observation will shew, present towards the inner corner of the eye the whole of its flat surface to the upper, but it evidently slopes inward, and only the outer edge of the under lid touches the upper, and, by this means, a little gutter is formed, by which the superfluous moisture of the eye flows to the inner corner where there is a canal to convey it away, and therefore it neither accumulates in the eye, nor unpleasantly runs down the cheek.

Along the edges of the lids are placed numerous little hollows which can be plainly distinguished even in the living horse by slightly turning down the lid. These are the openings into numerous small cells containing a thick and unctuous fluid, by means of which the eyes are more accurately closed, and the edges of the lids defended from the acrimony of the tears.

The horse has no *eyebrows*, and the *eyelashes* are very peculiarly arranged. The rows of hair are longest and most numerous on the upper lid, and especially towards the outer or temporal corner, because the light comes from above; and, as the animal stands, and particularly when he is grazing, and from the lateral situation of his eyes, the greater portion of the light, and the attacks of insects, and the rolling down of moisture, would chiefly be from the outside or temples. Towards the inner corner of the eye there is little or no eyelash, because there is no probable danger or nuisance in that direction. Only a small quantity of light can enter from below, and therefore the lashes are thin and short; but as, in the act of grazing, insects may more readily climb up and be troublesome to the eye, towards the inner angle, there the principal or only hair is found on the lower lid. These apparently trifling circumstances will not be overlooked by the careful observer.

They who are unacquainted with the absurdities of stable management, or who have not carefully examined the abuses which may exist in their own establishments, can scarcely conceive the foolish and cruel practices of some carters and grooms. We know that when the groom is anxious that his horse should be as trim and neat all over as art can make him, the very eye-lashes are generally sacrificed. What has the poor animal suffered, when, travelling in the noon of day, the full blaze of the sun has fallen upon his eyes; and how many accidents have probably happened, from his being dazzled by the light, but which have been attributed to other causes.

If the horse has no eyebrow, there are several hairs or bristles scattered on the upper eyelid, and there is a projecting fold of the lid which discharges nearly the same office. It is more conspicuous in old horses than in young ones. Some horsemen do not like to see it, and associate the idea of it with weakness or disease of the eye. This is perfectly erroneous. It is a provision of nature to accomplish a certain purpose, and has nothing to do either with health or disease.

On the lower lid is a useful provision to warn the horse of the near approach of any object that might incommode or injure him, in the form of long projecting hairs or bristles, and which are plenteously embued with nervous influence, so that the slightest touch shall put the animal on his guard. We would request any of our readers, by whom the experiment never has been made, to touch very slightly the extremity of one of these hairs. They will be surprised to observe the sudden convulsive twitching of the lid, rendering the attack of the insect absolutely impossible. Those ignorant grooms, however, who cut away the eye-lashes, do not spare these useful feelers.

The eye is exposed to the action of the atmospheric air, and the process of evaporation, destructive of its transparency, is continually going on. The eye of the horse, or the visible part of the eye, is, likewise, more prominent and larger than in the human being, and the animal is often subject to extreme annoyance from dust and insects, while he has no hands or other guard to defend himself from the torture which they occasion. What is the provision of nature against this? Under the lid, and a little within the outer corner of the upper lid, is a large irregular body, the *lacrymal gland*, comparatively larger than in the human being, secreting an aqueous fluid, and which fluid slowly issuing out from the gland, and, more especially, pressed out of it by the act of winking, flows over the eye, supplies it with moisture, and washes off all impurities. Human ingenuity could not have selected a situation from which the fluid could be conveyed over the eye with more advantage for this purpose.

When this fluid is secreted in an undue quantity, and flows over the eye, it is called *tears*. An increased flow of tears is produced by any thing that irritates the eye, and, therefore, a constant accompaniment and symptom of inflammation. A horse with any degree of weeping, or the flowing of the tears down the cheek, should be regarded with much suspicion. In the human being an unusual secretion of tears is often caused by bodily pain, and emotions of the mind; and so it is occasionally in the horse. We have seen it repeatedly, under acute pain or brutal usage. John Lawrence, speaking of the cruelty exercised (and we know still too often exercised) by some dealers in what they call "firing" a horse before he is led out for sale, in order to arouse every spark of mettle, says, "more than fifty years have passed away, and I have before my eyes a poor mare stone blind, exquisitely shaped, and showing all the marks of high blood, whom I saw unmercifully cut with the whip a quarter of an hour before the sale, to bring her to the use of her stiffened limbs, *while the tears were trickling down her cheeks*."

Having passed over the eye, the fluid is conveyed by the little canal of which we have spoken, formed by the sloping of the under lid, towards the corner of the eye; and there are two little orifices, that conduct it to a small reservoir within, and at the upper part of the lacrymal bone, (fig. *i*, p. 66). A little protuberance of a black or pied colour, called the *caruncle*, placed in the very corner of the eye, and to be seen without opening the lids, is situated between these orifices, and guides the fluid into them. From this reservoir the tears are conveyed by a long canal, the *lacrymal duct*, partly bony, and partly membranous, to the lower part of the nose. A little within the nostril, and on the division between the nostrils, is seen the lower opening of this canal; the situation of which our readers should carefully mark, and bear in mind its real use, for not only horsemen, but even some careless veterinary surgeons, have mistaken it for a glanderous ulcer, and have condemned a useful and valuable animal. It is found just before the skin of the muzzle terminates, and the more delicate membrane of the nostril commences. The opening of the canal is placed thus low because the membrane of the nose is exceedingly delicate, and would be irritated and made sore by the frequent or constant running down of the tears.

This canal is sometimes obstructed in the human being, and the reservoir is distended and bursts; an ulcer is then formed, very difficult to heal, and only healed by a metal style or pin, penetrating into the duct, being worn for a considerable time. Fortunately the lacrymal duct is rarely obstructed in the horse, for, if it were, and ulceration were to follow, no mechanical contrivance could retain the style or pin in its place. The dog is subject to obstructions of this canal, and the ulcer formed by the bursting of the sac is never healed.

There is, however, something yet wanting. We have a provision for supplying the eye with requisite moisture, and for washing from off the transparent part of it insects or dust which may annoy the animal. What becomes of these impurities when thus washed off? Are they carried by the tears to the corner of the eye, and so pass down this duct, and irritate and obstruct it; or do they accumulate at the inner angle of the eye? There is a beautiful contrivance for disposing of them as fast as they enter the eye. Concealed within the inner corner of the eye, or only the margin of it, black or pied, visible, is a triangular-shaped cartilage, the *haw*, with its broad part before. It is concave within, exactly to suit the globe of the eye; and it is convex without, accurately to adapt itself to the membrane lining the lid; and the base of it is reduced to a thin or almost sharp edge. At the will of the animal this is suddenly protruded from its hiding place, passes rapidly over the eye, and shovels up every nuisance mixed with the tears, and then, being speedily drawn back, the dust or insect is wiped off as the cartilage again passes under the corner of the eye.

How is this managed? This cartilage has no muscle attached to it, and the limbs, and the different parts of the body, when put into motion by the influence of the will, are moved invariably by muscles. The mechanism is simple and effectual. There is a great mass of fat at the back of the eye, that the eye may be easily moved; and this fat is particularly accumulated about the inner corner of the eye, and beneath, and at the point of this cartilage. The eye of the horse has likewise very strong muscles attached to it, and one, peculiar to quadrupeds, of extraordinary power, and by whose aid, if the animal has not hands to ward off a danger that threatens, he is at least enabled to draw the eye back almost out of the reach of that danger.

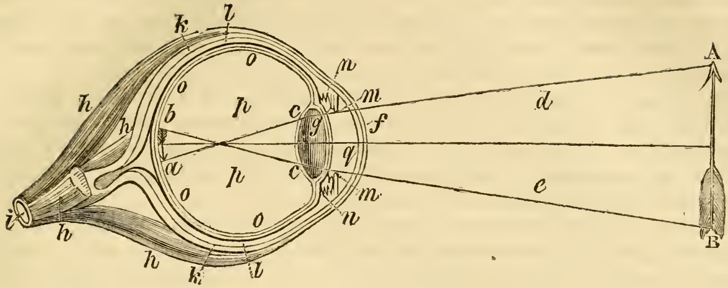
Dust, or gravel, or insects, shall have entered the eye, and annoy the horse. This peculiar muscle suddenly acts. The eye is forcibly drawn back, and presses upon the fatty matter. That may be displaced, but cannot be squeezed into less compass. It is forced violently towards the inner corner of the eye, and it drives before it the haw; and the haw having likewise some fat about the point of it, and being placed between the eye and an exceedingly smooth and polished bone, and, being pressed upon by the eye as it is violently drawn back, shoots out with the rapidity of lightning, and, guided by the eyelids, projects over the eye, and thus carries off the offending matter.

In what way shall we draw the haw back again without muscular action? Another principle is called into play, of which we have already spoken, and of which we shall have much to say, elasticity. It is that principle by which a body yields to a certain force impressed upon it, and returns to its former state as soon as that force is removed. It is that by which the ligament of the neck (p. 68), while it supports the head, enables the horse to graze,—by which the heart expands after closing on and propelling forward the blood in its ventricles,—by which the artery contracts on the blood that has distended it, and by which many of the most important functions of life are influenced or governed. This muscle ceases to act. The eye resumes its natural situation in the orbit. There is room for the fatty matter to return to its place, and it immediately returns by the elasticity of the membrane by which it is covered; and it draws after it this cartilage with which it is connected, and the return is as rapid as the projection.

The old farriers strangely misunderstood the nature and design of the haw, and many of the present day do not seem to be much better informed. When from sympathy with other parts of the eye labouring under inflammation, and becoming itself inflamed, and increased in bulk, and the neighbouring parts likewise thickened, it was either forced out of its place, or voluntarily protruded to defend the eye from the action of light, and could not return, they mistook it for some injurious excrescence or tumour, and proceeded to cut it out. The "*haw* in the eyes," is a disease well known to the majority of grooms, and this sad remedy for it is deemed the only cure. It is a barbarous practice, and if they were compelled to walk half a dozen miles in a thick dust, and without being permitted to wipe or to cleanse the eye, they would feel the torture to which they doom this noble animal, when afterwards employed in their service. A little patience having been exercised, and a few cooling applications made to the eye while the inflammation lasted, and, afterwards, some mild astringent ones, and other proper means employed, the tumour would have disappeared, the haw would have returned to its place, and the animal would have discharged the duties required of him, without inconvenience to himself, instead of the agony to which an unguarded and unprotected eye must frequently expose him.

The loss of blood occasioned by the cutting out of the haw may frequently relieve the inflammation of the eye; and the evident amendment which follows, induces these wise men to believe that they have performed an excellent operation; but the same loss of blood, by scarification of the overloaded vessels of the conjunctiva, would be equally beneficial, and the animal would not be deprived of an instrument of admirable use to him.

The eye is of a globular figure, yet not a perfect globe. It is rather composed of parts of two globes. The half of the one, *f*, smaller and transparent in front, and of the other, *p*, larger, and the coat of it opaque, behind. We shall most conveniently begin with the coats of the eye,



A B A supposed object viewed by the animal, and an inverted image of which, *a*, *b*, is thrown on the retina at the back of the eye.

c c The points where the rays, having passed the cornea and the lens, converge by the refractive power of the lens.

d e The rays proceeding from the extremities of the object to the eye.

f The *cornea*, or horny and transparent part of the eye, covered by the *conjunctiva*, uniting different parts together.

g The crystalline (crystal or glassy) lens, behind the pupil, and in front of the vitreous humour.

h h Muscles of the eye.

i The optic nerve, or nerve of sight.

k The *sclerotica* (hard firm coat) covering the whole of the eye except the portion occupied by the cornea, and being a seeming prolongation of the covering of the optic nerve.

l The *choroides* (receptacle or covering), or choroid coat, covered with a black secretion or paint.

m m The *iris*, or rainbow-coloured circular membrane, under the cornea, in front of the eye, and on which the colour of the eye depends. The duplicature behind is the *uvea*, from being coloured like a grape. The opening in the centre is the pupil.

n n The ciliary (hair-like) processes.

o The *retina*, or net-like expansion of the optic nerve, spread over the whole of the choroides as far as the lens.

p The vitreous (glass-like) humour filling the whole of the cavity of the eye behind the lens.

q The aqueous (water-like) humour filling the space between the cornea and the lens.

The *conjunctiva*, *f*, is that membrane which lines the lids, and covers the fore part of the eye. It covers all that we can see or feel of the eye, and even its transparent part. It is itself transparent, and transmits the colour of the parts beneath. It is very susceptible of inflammation, during which the lining of the lids will become intensely red, and the white of the eye will be first streaked with red vessels, and then covered with a complete mesh of them, and the cornea will become cloudy and opaque. It is the seat of various diseases, and particularly in it commences the sad inflammation of the horse's eye, which bids defiance to the veterinary surgeon's skill, and, almost invariably, terminates in blindness.

The examination of the conjunctiva, by turning down the lid, will enable us to form an accurate judgment of the degree of inflammation which exists in the eye. Horsemen and farriers, however, seem to think that it likewise indicates the degree of inflammation in almost every other part, or, at least, of the general fever which may accompany local inflammation. There is a part which much more clearly indicates this, and especially if the general disturbance be accompanied or produced by any affection of the lungs—a part which will rarely deceive, and is more easily got at, *viz.* the membrane lining the nose. If the edge of the nostril be lifted up, the colour of the nostril will faithfully indicate the degree of chest affection, and of general inflammation or fever.

Covering the back part of the eye, and, indeed, four-fifths of the globe of the eye, is the *sclerotica, k.* It is an exceedingly strong membrane, composed of fibres interweaving with each other, and almost defying the possibility of separation. An organ so delicate and so important as the eye, requires secure protection.

This is a highly elastic membrane. It is necessary that it should be so, when we consider that the eye is surrounded by several, and very powerful muscles, which must temporarily, and even for the purposes of vision, alter its shape. The elasticity of the sclerotica is usefully exhibited, by its causing the globe of the eye to resume its former and natural shape, as soon as the action of the muscle ceases.

The sclerotica has very few blood vessels; is scarcely sensible; and its diseases, except when it participates in general disturbance or disorganization, are rarely brought under our notice. We therefore pass on to the cornea.

The *cornea* is, or we should wish it to be, the only visible part of the horse's eye, for we repeat, that the exhibition of much white about it is a symptom of wickedness. The cornea fills up the vacuity which is left by the sclerotica, in the fore part of the eye, and although closely united to the sclerotica, may be separated from it, and will drop out like a watch glass. It is not round, but wider from side to side, than from top to bottom; and the curve rather broader towards the inner than the outer corner of the eye, so that the near eye may be known from the off, after it is taken from the head.

The convexity or projection of the cornea is a point of considerable importance. The prominence of the eye certainly adds much to the beauty of the animal, but we shall see presently, when we consider the eye as the organ of sight, that by being too prominent, the rays of light may be rendered too convergent, and the vision indistinct; or if the cornea be small and flat, the rays may not be convergent enough, and perfect vision destroyed; and in either case, the horse may unpleasantly start, or suddenly and dangerously turn round. An eye neither too prominent nor too flat will be nearest to perfection.

It ought to be perfectly transparent, and any cloudiness or opacity is the consequence of disease. It is an exceedingly firm and dense membrane, and can scarcely be pierced by the sharpest instrument. The cornea is composed of many different plates, laid over one another, and, between each, at least in a state of health, is a fluid, which is the cause of its transparency; and the evaporation of which, after death, produces the leaden or glazed appearance of the eye. When it appears to be opaque, it is not often, and never at first, that the cornea is changed. It is the conjunctiva, the membrane that spreads over it, that now carries through its numerous vessels white blood instead of that which was perfectly pellucid or clear; or there is a secretion of a milky fluid, over or through the conjunctiva, leaving the cornea beneath unaffected. If, however, the inflammation of the conjunctiva continues, a thick fluid is at length thrown out, between the plates of the cornea, and the cloudiness is converted into perfect opacity.

There is nothing which deserves so much attention from the purchaser of a horse, as the perfect transparency of the cornea over the whole of its surface. The eye should be examined for this purpose, both in front, and with the face of the examiner close to the cheek of the horse, under and behind the eye. The latter method of looking through the cornea is the most satisfactory, so far as the transparency of that part of the eye is concerned. During this examination the horse should not be in the open air, but in the stable, standing in the door-way and a little within the door. If any small, faint, whitish lines appear to cross the cornea, or spread over any part of it, they are assuredly the remains of previous inflammation ; or although the centre and bulk of the cornea should be perfectly clear, yet if round the edge of it, where it unites with the sclerotica, there should be a narrow ring or circle of haziness, the conclusion is equally true, but the inflammation occurred at a more distant period. Whether, however, the inflammation has lately existed, or several weeks or months have elapsed since it was subdued, there is every probability that it will recur.

There is one little caution to be added. The cornea in its natural state is not only a beautifully transparent body, but it reflects, even in proportion to its transparency, many of the rays which fall upon it, and, if there be a white object immediately before the eye, as a very light waistcoat, or much display of a white neckcloth, the reflection may puzzle an experienced observer, and has misled the careless one. The coat should be buttoned up, and the white cravat carefully concealed.

Within the sclerotica, and connected with it by innumerable minute fibres and vessels, is the *choroid coat, l.* It is a very delicate membrane, and extends over the whole of the internal part of the eye, from the optic nerve to the cornea. It secretes a dark coloured substance or paint, by which it is covered ; the intention of which, like the inside of our telescopes and microscopes, has been supposed to be, to absorb any stray rays of light which might dazzle and confuse. The black paint, *pigmentum nigrum*, seems perfectly to discharge this function in the human eye. It is placed immediately under the retina or expansion of the optic nerve. The rays of light fall on the retina, and, penetrating its delicate substance, are immediately absorbed or destroyed, by the black covering of the choroides underneath. For the perfection of many of his best pleasures, and, particularly of his intellectual powers, man wants the vivid impression which will be caused by the admission of the rays of light into a perfectly dark chamber ; and when the light of the sun begins to fail, his superior intelligence has enabled him to discover various methods of substituting an artificial day, after the natural one has closed. Other animals, without this power of kindling another although inferior light, have far more to do with the night than we have. Many of them sleep through the glare of day, and awake, and are busy during the period of darkness. Our servant the ox occupies some hours of the night in grazing ; the sheep does so when not folded in his pen ; and the horse, worked during the day for our convenience and profit, has often little more than the period of night allotted to him for nourishment and repose. Then it is necessary that, by some peculiar and excellent contrivance, these hours of comparative or total darkness to us should be partially yet sufficiently illuminated for them ; and therefore, in the horse, the dark brown or black coat of the choroides does not extend over the whole of the internal part of the eye, or rather, it is not found on any part on which the rays proceeding from the objects could fall. It is not found in any part of what may be called the field of vision ; but, in its place, a bright variegated green is spread, and more over the upper part than the lower, because the animal's food, and the objects which it is of consequence for him to notice, are usually below the level of his head—

thus, by suffering the impression to remain longer on the retina, or by some portion of light reflected from this variegated bed on which the retina reposes, or in some other inexplicable but efficient way, enabling the animal, even in comparative darkness, to possess a power of vision equal to his wants.

The reader may see in the dusk, or even when duskiness is fast yielding to utter darkness, the beautiful sea-green reflexion from the eye of the horse. It is that lucid variegated carpet of which we are now speaking.

Who is unaware that in the fading glimmering of the evening, and even in the darker shades of night, his horse can see surrounding objects much better than his rider, and who, resigning himself to the guidance of that sagacious and faithful animal, has not been carried in safety to his journey's end, when he would otherwise have been bewildered?

If our reader has not seen this beautiful pigment in the eye of the horse, we would entreat him to take the earliest opportunity of examining it, and he will be convinced what care that Being, who gave all things life, has taken that each shall be fitted for his situation. The horse has not the intelligence of man, and may not want for any purpose of pleasure or improvement, the vivid picture of surrounding objects, which the retina of the human being presents. A thousand minute but exquisite beauties would be lost upon him. He has not the faculty to appreciate, or to profit by them. If, therefore, his sense of vision may not be so strong during the day, it is made up to him by the increased power of vision in the dark.

Perfectly white and cream coloured horses have a peculiar appearance of the eyes. The pupil is red instead of black. They have no black paint or brilliant carpet. It is the choroid coat itself which we see in them, and not its covering; and the red appearance is caused by the numerous blood-vessels which are found on every part of that coat.

When we come to treat of other domestic animals, we shall tell how this carpet is varied in colour to suit the situation and necessity of each. In the ox it is of a dark green. He has not many enemies to fear, nor much difficulty in searching for nourishment, and the colour of the eye is adapted to his food. In the cat and all his varieties, it is yellow. We have heard of the eyes of the lion appearing like two flaming torches in the night. It is the reflection of the little light about him, concentred on the yellow carpet. There are few of our readers who have not seen the same singular glare from the eyes of the domestic cat. In the wolf, and likewise in the dog, who, in his wild state, prowls chiefly at night, it is grey. In the poor, unjustly persecuted badger, who scarcely dares to crawl forth at night, although sheltered by the thickest darkness, it is white; and the ferret who is destined to hunt his prey through all its winding retreats, and in what would be to us absolute darkness, has no paint on the choroides.

Tracing the choroides towards the fore part of the eye, we perceive that it is reflected from the side to the edge of the lens, *n*, and has the appearance of several plaits or folds. They are actually foldings of the membrane. It is not diminished in size, but it has less space to cover, and therefore there must be these duplicatures or plaits. They are very usefully employed in the place in which we find them. They prevent the passage of any rays of light on the outside of the lens, and which, proceeding forward in various directions, and uncondensed by the power of the lens, would render vision confused or imperfect. These folds of the choroides are called the *ciliary processes.*

Of the last and innermost coat of the eye, the *retina*, for which all the others were constructed, we shall be better able to speak when we have explained the contents of the eye.

Within the cornea, and occupying the fore part of the eye, is the *aqueous humour*, *p*, so termed from its resemblance to pure water. It is that by which the cornea is preserved in its protuberant and rounded form. It extends to the crystalline lens *q*, and therefore a portion of it, although a very small one, is behind the iris (*m*, p. 89). Floating in this fluid is a membrane, with an an oblong aperture, called the iris. It is that which gives colour to the eye. The human eye is said to be black, or hazel, or blue according to the colour of this membrane or curtain; and it is called the iris, or rainbow, from its beautiful, intermingling hues. The colour varies but little in the horse, and always bears some analogy to that of the skin. We rarely see it lighter than a hazel, or darker than a brown. The sparkling black of the human being is never found. Horses perfectly white, or cream-coloured, have the iris white and the pupil red. When horses of other colours, and which are usually pied, have a white iris and a black pupil, they are said to be *wall-eyed.* Vulgar opinion has decided that a wall-eyed horse is never subject to blindness, but this we believe to be altogether erroneous. There is no difference of structure which can produce this exemption; but the wall-eyed horse, from this singular and unpleasant appearance, and his frequent want of breeding, may not be exposed to many of the usual causes of inflammation.

The aperture in the iris is termed the *pupil,* and through it light passes to the inner chamber of the eye. The pupil is oblong, and variable in size. It varies with the intensity or degree of light which falls upon the eye. In a dark stable the pupil is expanded to admit a great proportion of the light which falls upon the cornea, but when the horse is brought towards the door of the stable, and more light is thrown upon the eye, the pupil contracts in order to keep out that extra quantity which would be painful to the animal, and injurious to vision. When opposed directly to the sun, the aperture will almost close.

This alteration of form in the pupil is effected by the muscular fibres which enter into the composition of the iris. When these fibres contract, it is plain that the pupil must enlarge. The membrane itself must be drawn into less compass, and therefore the aperture in the centre must be greater. When the fibres are relaxed, the pupil must proportionably diminish. The motions of the iris are not at all under the control of the will, nor is the animal sensible of them. They are produced by sympathy with the state of the retina. When a quantity of light, sufficient to dazzle or give pain, falls upon the retina, it is exhausted, the fibres of the iris sympathize with it, and relax, and the curtain falls. When a deficient portion of light reaches the retina, and vision is indistinct, we are conscious of an apparent effort to bring the object clearly into view; the fibres then contract, and the aperture enlarges, and more light is admitted.

This dilatation or contraction of the pupil gives a useful method of ascertaining the existence of blindness in one eye or in both. There is a description of blindness, which a close examination of the eye, even by a person accustomed to horses, will not always detect. The cornea and crystalline lens remain perfectly transparent, but the retina is palsied, and is not affected by light; and good judges have been deceived when blindness of this description has been confined to one eye. A horse blind in both eyes will usually have his ears in constant and rapid motion, directing them in quick succession to every quarter; he will likewise hang back in his halter in a peculiar way; and will lift his feet high as if he were stepping over some obstacle, when there is actually nothing to obstruct his passage; and there will be an evident uncertainty in the putting down of his feet: these things, however, have been overlooked by the careless and inexpert, and a blind horse has been bought as a sound one. In blindness of one eye little or nothing of this characteristic gait and manner can be perceived; yet although a one-eyed horse may not be absolutely condemned for the common business of the carriage or the road, he is generally worthless as a hunter, for he cannot measure his distances, and will run into his leaps*. Many a sportsman, puzzled and angry at the sudden blundering of his horse, or injured by one or more stunning falls, have found a very natural, although unexpected explanation of it in the blindness of one eye, and that perhaps produced through his own fault, by over-riding his willing and valuable beast, and causing a determination of blood to the eye, which proved fatal to the delicate texture of the retina. Even for the carriage or the road, he is, however, sadly deteriorated; for, his eyes being placed laterally, his field of observation must be materially lessened.

Let the size of both pupils be carefully noticed before the horse is removed from the stable, and, as he is led to the door, observe whether they both contract, and equally so, with the increase of light. If the horse should be first seen in the open air, let it be observed whether the pupils are precisely of the same size; then let the hand be placed over each eye alternately, and held there for a little while, and let it be observed whether the pupil dilates with the abstraction of light, and equally dilates in each eye.

Hanging from the upper edge of the pupil of the horse, are found two or three round black bodies, as large as millet seeds. When the horse is suddenly brought into an intense light, and the pupil is closed, these bodies present a singular appearance, being squeezed out from between the edges of the iris. An equal number, but much smaller, are attached to the edge of the lower portion of the iris. Their general use is probably to intercept portions of light which would be troublesome or injurious; but their principal function is accomplished during the act of grazing. They are larger on the upper edge of the iris, and are placed on the outer side of the pupil, evidently to discharge the same function which we have attributed to the eyelashes, to obstruct the light in those directions in which it would come with greatest force, both from above and even from below, while, at the same time, the field of view is perfectly open, so far as it regards the pasture on which the horse is grazing.

Our cut, *m*, gives a duplicature of the iris, or the back surface of it. This is called the *uvea*, and it is covered with a thick coat of black mucus, to arrest the rays of light, and to prevent them from entering the eye in any other way than through the pupil. The colour of the iris is, in some unknown way, connected with this black paint behind. Wall-eyed horses, whose iris is white, have no uvea.

We now arrive at a body on which all the important uses of the eye mainly depend, the *crystalline lens*, *g*, so called from its resemblance to a piece of crystal, or transparent glass. It is of a thick jelly-like consistence, thicker and firmer towards the centre, and convex on each side, but more convex on the inner than the outer side. It is enclosed in a delicate transparent bag or *capsule*, and is placed between the aqueous and the vitreous humors, and received into a hollow in the vitreous humor with which it exactly corresponds. It has, from its density, and its double convexity, the chief concern in conveying the rays of light which pass into the pupil.

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* Mr. W. Percivall, however, in his excellent Lectures on Veterinary Art, vol. iii. p. 201, says, "The loss of one eye does not enfeeble sight, because the other acquires greater energy, though it much contracts the field of vision. It is said to render the conception erring, and the case of mis-judgment of distances is the one commonly brought forward to show this. All I can say on this point is, that the best hunter I ever possessed, a horse gifted with extraordinary powers for leaping, was a one-eyed horse, and this animal carried me through a hunting season, without, to my recollection, making one single blunder in leaping."

The lens is very apt to be affected from long or violent inflammation of the conjunctiva, and either its capsule becomes cloudy, and imperfectly transmits the light, or the substance of the lens becomes opaque. The examination of the horse, with a view to detect this, must either be in the shade, or at a stable door, where the light shall fall on the horse from above and in front; and in conducting this examination we would more particularly caution the intended purchaser against a superfluity of white about his neck. Holding the head of the horse a little up, and the light coming in the direction which we have described, the condition of the lens will at once be evident. The confirmed *cataract*, or the opaque lens of long standing, will exhibit a *pearly* appearance, which cannot be mistaken, and will frequently be attended with a change of form, a portion of the lens being forced forwards into the pupil. Although the disease may not have proceeded so far as this, yet if there be the slightest cloudiness of the lens, either generally, or in the form of a minute spot in the centre, and with or without lines radiating from that spot, the horse is to be condemned; for in ninety-nine cases out of a hundred the disease will proceed, and cataract, or complete opacity of the lens, and absolute blindness, will be the result.

Cataract in the human being may, to a very considerable extent, be remedied. The opaque lens may be extracted, or it may be forced into the vitreous humors, and there existing as a foreign body it will soon be absorbed and disappear. These operations are impossible in the horse, for, in the first place, there is a muscle of which we have already spoken, and to be presently described, peculiar to quadrupeds, and of such power as generally to draw back the eye too far into its socket for the surgeon to be enabled to make his incision; and, could the incision be made, the action of this muscle would force out the greater part of the contents of the eye, and this organ would almost waste away. If, however, the opaque lens could be withdrawn or depressed, and the mechanism of the eye were not otherwise injured, the operation would be totally useless, for we could not make the horse wear those spectacles, whose converging power might compensate for the loss of the lens.

Behind the lens, and occupying four-fifths of the cavity of the eye, is the *vitreous humor* (glassy, or resembling glass). It seems, when first taken from the eye, to be of the consistence of a jelly, of beautiful transparency; but if it is punctured, a fluid escapes from it as limpid and as thin as water, and when this has been suffered completely to ooze out, a mass of membraneous bags or cells remains. The *vitreous humor* then consists of a watery fluid contained in these cells, but the fluid and the cells form a body of considerably greater density than the aqueous fluid in the front of the eye.

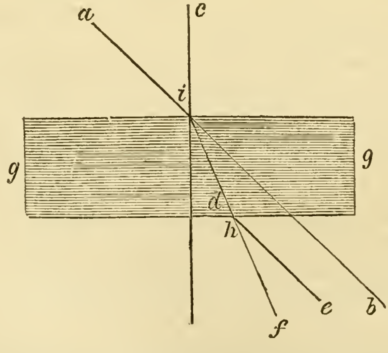
Last of all, between the *vitreous humor* and the *choroid coat*, is the retina, *o*, or net-like membrane. It is an expansion of the substance, *g*, of the optic nerve. When that nerve has reached the back of the eye, and penetrated through the sclerotic and choroid coats, it first enlarges into a little white prominence, and from that proceed radiations or expansions of nervous matter, which spread over the whole of the choroid coat, and form the third investment of the eye. The membrane by which this nervous pulp is supported, is so exceedingly fine and delicate, that it will tear with the slightest touch, and break even with its own weight. The membrane and the pulp are perfectly transparent in the living animal. The pupil appears to be black, because in the day time it imperfectly reflects the colour of the choroid coat beneath; in the dusk it is greenish, because, the glare of day being removed, the actual green of the paint appears.

On this expansion of nervous pulp, the rays of light from surrounding objects, condensed by the lens and the humors, fall, and producing a certain image corresponding with these objects, the animal is conscious of their existence and presence.

Light consists of particles, which, proceeding from the sun or other luminous bodies, fall on different objects, and being again reflected from them, and entering the eye, render these objects visible. If we are in a dark room, which we know to be filled with furniture, we see it not, and were it not for our previous knowledge of it, or did we not touch it, we should not be conscious of its existence; but if a candle be brought into the room, or if one of the shutters be opened, the light from the candle, or that admitted through the window, falls upon the different articles of furniture, and a portion of it being reflected from them, and reflected in every direction, some of the light enters the pupil of the eye, and we see the objects around us.

It proceeds from these objects to us in straight lines, and except it were impeded, or driven, or drawn out of its course by some body, it would continue to travel on for ever in straight lines. It passes through some bodies with perfect ease, as glass, and crystal, and water, but it is obstructed in its passage by others, as metals and wood. These substances through which it readily passes are said to be *transparent;* those by which its course is arrested are called *opaque.* It has an attraction for all bodies, stronger for some than for others. By the opaque body the greater part of it is absorbed, and although it passes through the transparent body, it feels and is affected by the attraction of that body. It is bent out of its way although not detained. This is called the refraction of light; and it is on the knowledge of this simple fact that all our optical instruments are constructed, and that we are enabled to explain the wonderful construction of the eye.

This little figure will make it sufficiently evident. A ray of light, *a*, shall



fall on a smooth or level piece of glass, in the direction *a b*, and that course, if it were not acted upon by the glass, it would pursue. But experience teaches us that it does not. It no sooner enters the glass, than it is bent out of its original course, and takes the direction *d*. It had been acted upon by two forces, the first impulse in the direction *a b*, and the attraction of the glass, in a perpendicular direction, as it approached it; and, obeying both forces, it took a new path, *f*, between the two forces, and more towards a line, *c*, drawn perpendicular to the surface of the glass. This new path it continued to pursue, until it had penetrated through the glass; and then, being about to quit the glass, it was once more acted upon by two forces;—this combined impulse in an oblique direction, and the attraction of the lower surface of the glass in a perpendicular one;—and as before, obeying both, it again traversed a new path, *e*, between both forces, and in a direction from the perpendicular.

The degree and kind of deviation from the original line will depend on the difference in density between the air and the glass or water, or whatever substance may be used, and likewise on the surface of the refracting body. Passing through a transparent substance, with a plain and level surface above and below, the rays will be bent out of their first direction, but will continue parallel to each other. Passing through a concave glass (a glass hollowed on one or both sides), the rays will *diverge* or separate; and traversing a convex one (rounded on one or both sides), they will converge or approach each other, and tend to a point; and the degree of convergence or divergence will depend on the degree of convexity or concavity.

Let us apply this to the mechanism of the eye of the horse (vide p. 89). We have spoken of the cornea, *f*, and the aqueous humour, *q*, and the crystalline lens, *g*, and the vitreous humour, *h*; but although possessed of different refractive powers, according to their form and density, (and the cornea from its convexity, and the crystalline lens from its density, being the principal agents,) they are so fitted to each other, that we may consider them as composing one exceedingly convex lens, and of such power, that the rays entering the pupil, *m*, are brought to a point within the very substance of the lens.

The place of distinct vision, however, will not be at this point, but a little way behind. If the glass of a spectacle, such as those generally worn by old people, be held between a candle and a piece of paper, the rays of light will converge by the convexity of the glass, and be brought to a very small surface or point on the paper; but on that point, there will be no distinct picture of the candle, and the paper must be gradually removed from the light, until a distance be found at which the image of the candle will be seen most vivid and distinct, although inverted. So (see the cut, p. 89) the retina which is spread over the internal coat of the eye is placed at a little distance behind the point where the rays meet and cross. If the eye be too convex, and its converging power too great, the rays will cross too soon, and the image will be formed, brightest and best, before they reach the retina, and the vision or sight will be imperfect and obscure. If the eye is not sufficiently convex, and consequently does not possess converging power enough, the rays will not cross until they are too near the retina, and the picture would be most luminous and distinct behind the retina; and thus, likewise, the sight would be imperfect and obscure*.

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* "In considering vision as achieved by means of an image formed at the bottom of the eye, we can never reflect without wonder on the smallness, yet correctness of the picture, the subtilty of the touch, and the fineness of the lines. A landscape of five or six square leagues is brought into a space of half an inch in diameter; yet the multitude of objects which it contains are all preserved, are all discriminated in their magnitudes, positions, figures, colours. A stage coach passing at its ordinary speed, for several minutes, passes in the eye only over one-twelfth of an inch, yet is the change of place in the image distinctly perceived throughout its whole progress."—*Paley's Natural Theology*, p. 32.

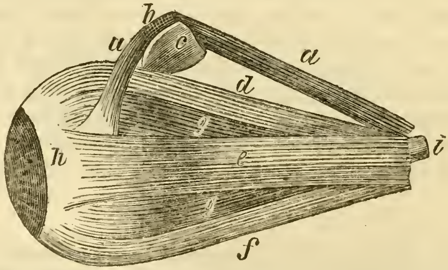
We are of course unable to ascertain when the horse experiences either of these kinds of indistinct vision, nor are we able to offer any remedy for them: but nothing can be more certain than that his sight is frequently very imperfect, from one of these causes. There is a *shying* often the result of cowardice or playfulness, or want of work; but at other times proving, beyond contradiction, a defect of sight. A horse will manifestly mistake the nature of the object before him; he will run against that which he should have seen; or he will be terrified by a tree or bird, which should not have caused alarm.

This defect of sight is more dangerous than blindness. A blind horse will resign himself to the guidance of his rider, or driver; but against the misconception and starting of a shying horse, there is no defence. That horses grow shy as they grow old, no one accustomed to them will deny; and no intelligent person will be slow in attributing it to the right cause—a decay in the organ of vision,—a loss of convexity in the eye, lessening the convergency of the rays, and throwing the perfect image beyond, and not on the retina. There is a striking difference in the convexity of the cornea in the colt and the old horse; and both of them, probably, may shy from opposite causes; the one from a cornea too prominent, and the other from one too flat. We do not think that, in the usual examination of the horse previous to purchase, sufficient attention is paid to the convexity of the cornea.

The remedy for shying will be considered when we speak of the *vices* of horses.

There is a provision yet wanting. The horse has a very extended field of view, but many persons are not perhaps aware how little of it he can command at a time. There is not one of our readers who can make out a single line of our treatise without changing the direction of the eye. It is curious to follow the motion of the eyes of a rapid reader. To move the head and neck in order to adapt the eye to the whole scene before us, would be awkward and fatiguing, and nature has adopted a simpler and better method. She has given no fewer than seven muscles to the horse, to turn this little but important organ; and, that they might act with sufficient power and quickness, no less than six nerves are directed to the muscles of the eye generally, or to particular muscles; and the eye rests on a mass of fat, that it may be turned with little exertion of power, and without friction.

MUSCLES OF THE EYE.



There are four straight muscles, three of which are represented in our cut, *d*, *e*, and *f*, rising from the back of the orbit, and inserted into the ball of the eye, opposite to each other, and at equal distances from each other. One, *d*, runs to the upper part of the eye, just behind the transparent and visible portion of it, and its office is clearly to raise the eye. When it contracts, the eye must be drawn upward. Another, *f*, is inserted exactly opposite, at the bottom of the eye; and its office is as clearly to depress the eye, or enable the animal to look downwards. A third, *e*, is inserted at the outer corner, and by means of it the eye is turned outward, and, from the situation of the eye of the horse, considerably backward; and the fourth is inserted at the inner corner, turning the eye inward. They can thus rotate or turn the eye in any direction the animal wishes. If the upper and outer muscles are called into action, the horse looks upward and outward, and more upward than outward in proportion as the upper muscle acts, at the will of the animal, more powerfully than the outer; and thus, by the action of one of them, or the combined action of any two of them, the eye may be immediately and accurately directed to every point.

These muscles, however, have another duty to discharge. They support the eye in its place. In the usual position of the head of the horse, they must be to a certain degree employed for this purpose; but when he is grazing or feeding, the principal weight of the eye rests upon them; and then, lest from this slanting and downward position of the head, when the horse is so often and so long employed in feeding, they should be fatigued, another muscle is added, peculiar to quadrupeds, called the *retractor* (*drawer-back*), or the *suspensorius* (*suspensory*) muscle, *g*. It arises from the edge of the foramen or hole through which the optic nerve enters the orbit—surrounds the nerve as it proceeds forward, and then, partially dividing into four parts, is attached to the back part of the eye. Its office is evidently to support the eye generally, or, when it is suddenly called into powerful action, and assisted by the straight muscles, it draws the eye back out of the reach of threatening danger, and in the act of drawing it back causes the haw to protrude in the manner which we have already described, as an additional defence.

The power of this muscle is very great. It has been proved, in attempted operations for cataract, to exert a force equal to more than twenty pounds; and it renders an operation on the eye almost impossible. It is an admirable substitute for the want of hands, to defend the eye from many things that would injure it; and, being partially separated into four divisions, it is also enabled to assist the straight muscles in turning the eye.

These muscles discharge another and a most important office. If we examine near and distant objects through a telescope, we must *alter the focus*, *i. e.* we must increase or diminish the length of the tube. We must shorten it a little when we examine distant objects, because the rays coming to us from them, in a less divergent direction, are sooner brought to a point by the power of the lens; so the straight and retractor muscles drawing back the eye, and forcing it upon the substance behind, and thus in a slight degree flattening it, bring the lens nearer to the retina, and adapt the eye to the observation of distant objects.

Still, however, being employed in supporting the weight of the eye, these muscles might not be able to turn it so rapidly and so extensively as the wishes or wants of the animal might require; therefore, two other muscles are given, which are used solely in turning the eye. They are called oblique muscles, because their course is obliquely across the eye. The upper one is most curiously constructed, *a*, *h*. It comes from the back part of the orbit, and takes a direction upwards and towards the inner side, and there, just under the ridge of the orbit, it passes through a perfect mechanical pulley, and, turning round, proceeds across the eye, and is inserted rather beyond the middle of the eye, towards the outer side. Thus the globe of the eye is evidently directed inward and upward. Something more, however, is accomplished by this singular mechanism. The eye is naturally deep in the orbit, that it may be more perfectly defended; but it may be necessary, occasionally, to bring the eye forward, and enlarge the field of vision. The eye is actually protruded under the influence of fear: not only are the lids opened more widely, but the eye is brought more forward. How can this possibly be accomplished? There are no muscles anterior to, or before the eye—there is no place for their insertion. The object is readily effected by this singular pulley, *b*, *c*. By the power of this muscle, the *trochlearis* or pulley-muscle, and the straight muscles at the same time not opposing it, or only regulating the direction of the eye, it is really brought somewhat forward. The lower oblique muscle rises just within the lacrymal bone (*i*, p. 66), and, proceeding across the eye, is fixed into the part of the sclerotica, opposite to the other oblique muscle, and it turns the eye in an opposite direction, assisting, however, the upper oblique, in bringing the eye forward from its socket.

CHAPTER VII.

INJURIES AND DISEASES OF THE SKULL—THE BRAIN—THE EARS—AND THE EYES.

We have now arrived at a convenient resting-place in our somewhat dry, but necessary description of the structure of the horse, and we willingly turn to more practical matter. We will consider the injuries and diseases of the parts we have surveyed. In entering, however, on this division of our work, we would premise, that it is impossible for us to give the farmer such an account of the nature and treatment of the diseases of horses as will enable him with safety to practise for himself, except in the commonest cases. The causes of most diseases are so obscure, their symptoms so variable, and their connexion with other maladies so complicated and mysterious, that a life devoted to professional study will alone qualify a man to become a judicious and successful practitioner on the diseases of the horse, and other domestic animals. Our object will be to communicate sufficient instruction to the farmer, to enable him to act with promptness and judgment when he cannot obtain professional assistance—to qualify him to form a satisfactory opinion of the skill of the veterinary surgeon whom he may employ, and, more especially, to divest him of those strange and absurd prejudices which, in a variety of cases, not only produce and prolong disease, but bring it to a fatal termination.

FRACTURE.

We have described the cavity of the skull of the horse as being so defended by the hardness of the parietal bones, and those bones as so covered by a mass of muscle, and protected above by an additional layer of bone, and the occipital bone as so exceedingly thick (see cut, p. 68), that a FRACTURE of the bones of the skull is almost impossible. It can only occur from brutal violence, except that, when a horse falls in the act of rearing, the occipital bone is sometimes fractured; when he falls forward, and the head comes in contact with the ground, the muzzle or jaws will receive the principal or whole force of the blow. When, however, fracture of the skull does occur, it is almost invariably fatal. A blow of sufficient violence and to send yet more blood to that organ which already had a great deal too much.

STOMACH-STAGGERS.

A disease not much unlike this is known under the name of STAGGERS. There are two varieties of it—the sleepy or stomach-staggers, and the mad-staggers; frequently, however, they are only different stages of the same disease, or varying with the cause that produced them. In STOMACH-STAGGERS the horse stands dull, sleepy, staggering; when roused he looks vacantly around him; perhaps seizes a lock of hay, and dozes again with it in his mouth; at length he drops, and dies: or the sleepiness passes off, and delirium comes on, when he falls, rises again, drops, beats himself about, and dies in convulsions. The cause of this is sufficiently evident; and the disease never occurs, except by the fault of those who have the management of the horse. It arises from over feeding. The horse has been permitted to get at a too great quantity of food, or food of an improper nature. When he has been kept for some hours without eating, and has been worked hard, and has become thoroughly hungry, he falls ravenously upon every kind of food he can get at; swallowing it faster than his small stomach can digest it; and no water being given to soften it, and to hasten its passage, the stomach becomes crammed, and having been previously exhausted by long fasting, is unable to contract upon its contents. The food soon begins to ferment and to swell, causing great distension; the brain sympathizes with this overloaded organ, and staggers are produced. We can easily imagine this, when we remember the sad headaches occasionally arising from an overfilled or disordered stomach. Sometimes the stomach is ruptured.

We have little to say of the treatment of the disease so far as medicine is concerned, except that as it is almost or quite impossible for the person most accustomed to horses to distinguish between the early stage of stomach and mad staggers (distension of the stomach, and inflammation of the brain), we should be most diligent and minute in our inquiry into the history of the horse for the preceding twenty-four hours—whether he could have got at an undue quantity of food, or had been worked hard and kept long fasting. Some say that there is a yellowness of the eye, and twitchings about the breast in the early stage of sleepy or stomach-staggers. We have seen a great many cases of stomach-staggers without this yellowness, or these catchings, and we believe that no one can certainly distinguish between the two, and that we must be guided entirely by the history of the case.

Bleed very largely;—that cannot do harm, and in mad staggers is indispensable. Give a good dose of physic—*that* also cannot do harm, although in stomach-staggers it cannot do much good, for it can scarcely find its way into the over-distended stomach, and it certainly cannot find its way through it. Keeping the horse from all food will be a very proper proceeding, whichever be the disease.

Some good judges have affirmed that a horse was never cured of stomach-staggers. It was formerly a very difficult thing, but the *stomach-pump* has done wonders in cases of poisoning in the human being, and, by means of a larger and somewhat altered pump, (which every veterinary surgeon, and, we think, every large proprietor of horses, should have on his premises,) this enormous mass of food may, without difficulty, be washed out.

If, however, we can say but little of the treatment of stomach-staggers, we have much to say of its prevention. It attacks old horses oftener than others, and horses that have been hardly worked, or that have been worked for many hours without food. Let no farmer delude himself with the idea that it is contagious. If his horses have occasionally slight fits of the staggers, or if the disease carries off several of them, he may be assured that there is something wrong in his management. One horse may get at the corn-bin, and cram himself to bursting; but if several are attacked, it is time for him to look about him. The cause will generally be found to be, too voracious feeding;—too much food given at once, and perhaps without water, after hard work and long fasting. Nothing is lost by the habitual use of the nose-bag, and a more equal division of the hours of labour and the times of feeding. Some careless and thoughtless people suffer their horses to go from morning to night without being fed, and then they wonder if sometimes the horses hang their heads, and droop, and cannot work. No horse should be worked more than four or five hours without being baited.

There is one consequence of this improper treatment, of which persons do not appear to be aware, although they suffer severely from it. A horse that has frequent half-attacks of staggers very often goes blind. It is not the common blindness from cataract, but a peculiarly glassy appearance of the eye. If the history of these blind horses could be told, it would be found that they had been subject to fits of drooping and dulness, and these produced by absurd management respecting labour and food.

Staggers have been known to occur when the animal is at grass; but this usually happens in poor, hard-worked, half-starved animals, and soon after they have been turned out, either in rich pasture, or in a salt marsh, and in hot weather.

There are, however, few diseases of the horse that are not occasionally epidemic, or produced by some influence of the atmosphere, of the nature of which we are ignorant; and stomach-staggers sometimes prevails in particular districts, where there is nothing remarkably wrong in the treatment of the horse. There is at that time something in the atmosphere which weakens the stomach, and disposes it to indigestion, and causes a little error in feeding to be dangerous, or produces considerable disease under the common circumstances of feeding. When this is the case the proprietors of horses should be particularly on their guard, for in most of the horses which then die, the distended stomach will be observed, and will be the actual cause of death. It is very possible that, at certain seasons, some poisonous plants may prevail, or that the hay may not be so nutritive or digestible, and thus the stomach may be weakened. The farmer will weigh all these things in his mind, and act accordingly.

MAD STAGGERS.

Mad Staggers (inflammation of the brain, brain fever) can, as we have said, be at first with difficulty distinguished from the sleepy, or stomach-staggers, but, after a while, the horse suddenly begins to heave at the flanks;—his nostrils expand;—his eyes unclose;—he has a wild and vacant stare, and delirium comes rapidly on. He dashes himself furiously about; there is no disposition to do mischief, but his motions are sudden and violent, and accompanied by perfect unconsciousness; and he becomes a terrifying and dangerous animal. This continues either until his former stupor returns, or he has literally worn himself out in frightful struggles.

There are only two diseases with which it can be confounded, and from both of them it is very readily distinguished, *viz.* colic and madness. In *colic* the horse rises and falls, but not with so much violence; he some-to break these bones must likewise irreparably injure the delicate and important organ which they protect.

The ridge, or outer and upper part of the orbit of the eye, is occasionally fractured. It happens from falling, or much oftener from violent blows. The slightest examination will detect the loosened pieces, but a professional man alone can here render effectual assistance. All, however, that he can do will be gently to replace the parts in their natural situation, and contrive to confine them there by adhesive plasters; to obviate inflammation by bleeding, physic, and low diet, and leave the rest to nature.

We proceed then to the *diseases* of the head, and the first of these is PRESSURE ON THE BRAIN. This may be produced by some fluid thrown out between the membranes, or occupying and distending the ventricles of the brain. In the grown horse this rarely occurs, but it is well known to breeders as an occasional disease of the foal, under the name of "water in the head." The head is either very much enlarged, or strangely deformed, or both; and the animal dies either in the act of foaling, or a few days after the birth.

MEGRIMS.

There is another kind of pressure on the brain, resulting from an unusual determination or flow of blood to it. This organ requires a large supply of blood to enable it to discharge its important functions. It is supposed that ten times more blood flows through the brain than through any other part of the frame of equal bulk. Nature, in the horse more than in many other animals, has made some admirable provisions to cause this great quantity of blood to flow into the brain without much velocity, and thereby to lessen the risk of suddenly overloading it or rupturing its vessels. The arteries pursue their course to the brain in a strangely winding and circuitous manner; and they enter the skull through bony holes which will admit of the enlargement of the vessels only to a very limited extent: yet, from various causes, of which the most common is violent exercise in a hot day, and the horse being fat and full of blood, more than the usual quantity will be sent to the head:—or from some negligence about the harness, as the collar being too small, or the curb-rein too tight, the blood will be prevented from returning from the head: and thus the larger vessels of the brain will be too long and injuriously distended, and, what is of more consequence, the small vessels which run through the substance of the brain will be enlarged, and the bulk of the brain will be increased, and it will press upon the origins of the nerves, and produce, almost without warning, loss of power and consciousness.

The mildest affection of this kind is known by the name of MEGRIMS. It comparatively rarely happens when the horse is ridden; but should he be driven, and, perhaps, rather quickly, he may perform a part of his journey with his usual cheerfulness and ease, when all at once he will stop, shake his head, be evidently giddy, and half unconscious. In a minute or two this will pass over, and he will go on again as if nothing had happened.

Frequently, however, the attack will be of a more serious nature. He will fall without the slightest warning, or suddenly run round once or twice, and then fall. He will either lie in a state of complete insensibility, or struggle with the utmost violence. In five or ten minutes he will begin gradually to come to himself; he will get up and proceed on his journey, yet somewhat dull, and evidently affected and exhausted by what had happened, although not seriously or permanently ill.

This is a very dangerous disease—dangerous to the horse, which will occasionally die on the spot, and peculiarly dangerous to those who drive him, for there will frequently be no warning or opportunity to escape. It likewise happens, that whether the vessels have been weakened by this violent distension, and afterwards offer less resistance to the flow of blood, or, whatever be the cause, a horse that has once been attacked by megrims is very subject to a return of the complaint. No prudent man will drive a horse that has had a second attack, especially if, in the intermediate time, he has taken proper means to prevent a recurrence of the fit.

At the moment of attack, a person who is able to bleed should take three or four quarts of blood from the neck; or any one can cut the bars of the palate in the manner explained where we describe the palate, and whence a considerable and sufficient quantity of blood may be readily obtained. The driver should pat and soothe the animal, and carefully examine the harness, and pursue his journey as gently as circumstances will permit. When he gets home, a dose of physic * should be administered if the horse can be spared, and the quantity of dry food lessened, and mashes given, or green meat, or the horse should be turned out at night, or turned out altogether for two or three months.

APOPLEXY.

The attack sometimes assumes a still more violent form. The horse falls and dies at once. It then rather resembles, or is the same with apoplexy in the human being. To this more serious form of the disease he is subject in the stable, and even at pasture; but there is generally some warning. He will be seen with the head low, extended almost to the ground, and supported against the manger. He staggers as he stands. If moved, he appears as if he would fall. His sight and hearing are evidently affected. This is not mad staggers, for no inflammation of the brain is found; nor stomach-staggers, for there is no distension of the stomach. The horse will continue in this way from one hour to twelve. He then falls;—grinds his teeth;—his eyes are open, protruded, and fixed—the pupil is dilated;—there are twitchings about the frame;—the muzzle is cold;—the vein of the neck is evidently swelled;—he is unable to swallow; —the drink is returned by the nostril or the mouth, and the dung often voided involuntarily:—the twitchings increase to strong convulsions, and death speedily closes the scene.

If there be time for medical treatment, the course to be pursued is plain enough. Bleed copiously†;—take at once eight or ten quarts. Bleed from a vein in preference to an artery, for an artery which supplies the brain cannot be got at. Bleed from the jugular or common neck vein, for that returns the blood from the brain, and a large quantity rapidly drawn from this vein may possibly give relief. Next back-rake, or remove the dung from the lower intestine with the hand, and give a strong dose of physic: but the case is usually hopeless, and the most decisive and skilful treatment alone can avail. We decidedly object to two methods of cure adopted by some farriers, and farmers too. The first is to blow pepper (and Cayenne pepper if they can get it) up the nostrils of the horse. The violent sneezing that will be produced if the animal is not too insensible must probably, or almost certainly, rupture some of the vessels already over-distended. The other practice is to give spices and bark to rouse the animal. The effect of these would be to quicken the circulation,

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* By physic, whenever the word occurs in this Treatise, we mean purgative medicine.

† Full directions for bleeding will be given, when we describe the various operations which it may be necessary to perform on the horse.

either upon the extent of the wound, or the degree of inflammation which may be excited. The time of the attack is uncertain, and may be postponed until the wound is nearly or quite healed. It occasionally follows nicking, docking, cropping, whether well or ill performed—whether properly attended to afterwards, or neglected. It has been traced to worms, and particularly to bots; but we do not think that there is any proof of this. Exposure to cold is a frequent cause; water dropping upon the back through the decayed roof of a stable; or the storm pelting upon the uncovered and shivering animal, while the thoughtless owner has sheltered himself.

The rational method of cure would seem to be, first to remove the local cause;—but this will seldom avail much. The irritation is become general, and the spasmodic action constitutional. The habit is formed, and will continue. It is well, however, to endeavour to discover the local cause. If it be a wound in the foot, let it be touched with the hot iron or the caustic, and kept open with digestive ointment. The new irritation thus produced, may lessen or remove the old one. If it follows nicking, let the incision be made deeper, and stimulated by digestive ointment;—and if it arise from docking, let the operation be repeated higher. In treating the constitutional disease, efforts must be made to tranquillise the system, and the most powerful agent is bleeding. We have known twenty pounds of blood taken at once and with manifest advantage. There is not a more powerful means of allaying general irritation. Temporary relaxation of the spasm will at least follow, and that will give the opportunity to do another thing in order to reduce and quiet the disturbed system, and that is, to give physic. Here again, that physic is best which is speediest in operation, and will lie in the smallest compass. The croton has no rival in this respect. The first dose should be a half-drachm, and the medicine repeated every six hours, in doses of ten grains, until it operates. The bowels, in all these nervous affections, are very torpid, and there is little danger of inflammation from an over dose of physic. The operation of the physic may be assisted by frequent injections, each containing a drachm of aloes dissolved in warm water—or, by means of the pump, to which we referred in page 103, whole pailfuls of warm water, or very thin gruel, may be thrown up.

Then, as it is a diseased action of the nerves proceeding from the spinal marrow, the whole of the spine should be blistered—three or four inches wide. The horse should be placed in a warm stable, yet with pure air, and should be clothed with two or three additional rugs, or, what is much better, sheep-skins warm from the animal, with the raw side inward; and changed as soon as they become dry or putrid.

Having bled largely, and physicked and blistered, we seek for other means to lull the irritation, and we have one at hand, small in bulk and potent in energy—opium. Give at once a quarter of an ounce, reduced to powder, and made into a drink with gruel, or in a small ball, (in its crude state it would be too long in dissolving in the stomach:) and give an additional drachm every six hours. If the jaw should be quite fixed, administer it in injections. The bowels must be attended to during the exhibition of the opium, and aloes given in small doses, to keep them in a lax state. Camphor and assafœtida may be given by those who please;—we are not aware that they will do injury, but opium is the sheet anchor of the veterinary practitioner.

Great caution and patience are requisite in administering the drinks, for the elevating of the head seems to be exceedingly painful to the horse. A ball may be divided into small pieces, and with a piece of cane or whalebone conveyed to the back part of the mouth, where it will be dissolved, and must be swallowed.

As soon as possible the strength should be supported by nutritive food. The appetite seldom fails in this disease; and it is painful to see the repeated eager efforts of the poor animal to allay his hunger. When his jaws are most firmly fixed, he will sometimes be able to suck in the liquid from a moist mash;—if he has the slightest command over them, he will contrive to swallow the greater part of the mash: and should there be room to introduce the mouth of a small horn, he will thankfully take as much gruel as his attendant will give him. Until the jaws are firmly locked, he may be suffered to have hay, although he should only chew it and drop it from the mouth; for this action of the muscles of the jaws may delay or prevent their total closure. Little medicine will be wanted as he gets better; nourishing food, not too liberally administered, will constitute the best tonic; and should the weather be sufficiently warm, few things will do him more good than to turn him out for two or three hours in the middle of the day. It will extend the muscles of his neck, and bring him to the use of his limbs.

Against one mode of treatment we enter our protest, from its cruelty and its inutility—the application of cold. Some turn the animal out uncovered in a frosty night. We have no faith in the practice of this: but placing the poor horse under a pump, and letting the water flow upon his spasmed limbs for hours together, or dashing it violently upon him, while he crouches and groans all the while, is both cruel and useless.

FITS, OR EPILEPSY.

The stream of nervous influence is sometimes rapid, but the suspensions are considerable, and this is the theory of Fits, or Epilepsy. Fortunately the horse is not often afflicted with this disease, although it is not unknown to the breeder. The attack is sudden. The animal stops; —trembles;—looks vacantly around him, and falls. Occasionally the convulsions which follow are slight; at other times they are terrible. The head and fore part of the horse are most affected, and the contortions are most singular. In a few minutes the convulsions cease; he gets up; looks around him with a kind of stupid astonishment; shakes his ears; urines; and eats or drinks as if nothing had happened.

The only hope of cure consists in discovering the cause of the fits; and an experienced practitioner must be consulted, if the animal be valuable: generally speaking, however, the cause is so difficult to discover, and the habit of fits is so soon formed, and they will so frequently return, even at a great distance of time, that he who values his own safety, or the lives of his family, will cease to use an epileptic horse.

PALSY.

The stream of nervous influence is sometimes stopped, and thence results Palsy. The power of the muscle is unimpaired, but the nervous energy is deficient. Palsy in the horse is usually confined to the hinder limbs. When purging has been too suddenly stopped, he becomes paralytic. It is sometimes the consequence of violent inflammation of the bowels. It is produced by falls, blows on the loins, injury in casting, and turning in a narrow stall. In these latter cases the spine has been evidently injured. Old carriage horses, and horses of draught of every kind, although not absolutely paralyzed, have often great stiffness in their gait, and difficulty of turning. Possibly they can turn one way and not the other. They are unwilling to lie down, from times plunges, but he more often rolls himself about; he looks frequently at his flanks with an expression of pain, and he is conscious.

In *madness* there may be more or less violence; there is sometimes a determination to do mischief; and there is always consciousness.

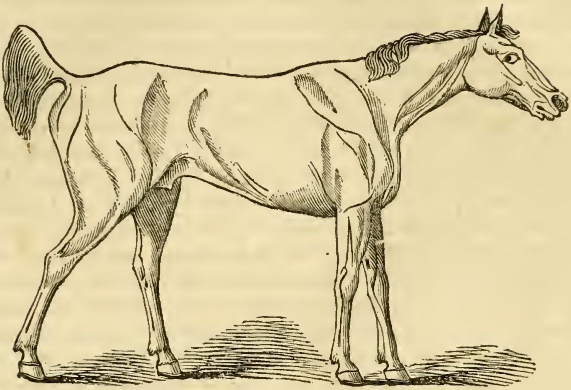
Over-exertion, when the horse is too fat or full of blood, or especially during hot weather, is a frequent cause of inflammation of the brain; but whatever will produce general fever, may be the cause of mad staggers.

The treatment adopted by the best practitioners is too often unsuccessful. The horse should be bled until he faints or drops; or if he be down, until he is evidently faint and weak. Both the neck-veins should be opened at once, and the fulness of the stream, or the quickness with which it is taken, is almost as important as the quantity. Physic should then be given. The purge that acts most quickly is the best, and that is the croton nut, powdered *at the time*, and given *in a drink*, in the dose of a half drachm, and followed by smaller doses of ten grains each, every six hours, with plenty of injections of warm soap and water, until the bowels are well opened. If the croton is not at hand, aloes may be given, but dissolved in hot water—an ounce of aloes at the first dose, and, afterwards, a quarter of an ounce every four hours, until purging is produced. This being effected, those medicines should be given which have a tendency to lessen the force of the circulation, and, consequently, the determination of blood to the head. The most powerful of these are the foxglove, and tartar emetic, in doses of a drachm each, three or four times in the day. Hellebore should not be given on account of the previously too great determination of blood to the brain. The head should be blistered, but rowels and setons give useless pain, for the horse is either cured or dead before they perceptibly begin to act.

TETANUS, OR LOCKED-JAW.

We have described the nerves as proceeding from the brain and spinal marrow, and conveying the power of feeling and motion to the whole frame. This power may be best conceived by considering it as an influence proceeding from the brain to every part. In a state of health, it is regularly and uniformly distributed; but it is much affected by disease. It may rush on violently and without interruption, and we have cramp, and tetanus, or locked-jaw: or the stream may be rapid, but with considerable suspensions, and we have fits; or it may be quite suspended, and we have palsy.

TETANUS is one of the most dreadful and fatal diseases to which the horse is subject. It is called LOCKED-JAW, because the muscles of the jaw are earliest and most powerfully affected. Tetanus is a constant spasm of all the voluntary muscles, and particularly of the neck, the spine, and the head. It is generally slow and very treacherous in its attack. The horse for a day or two does not appear to be quite well; he does not feed as usual; partly chews his food and drops it; and gulps his water. The owner at length finds out that the motion of the jaws is considerably limited, and some saliva is drivelling from the mouth. If he tries the mouth, he can open it only a very little way, or the jaws are perfectly and rigidly closed; and thus the only time in which the disease could have been successfully combated is lost. We have, therefore, given a cut of a horse labouring under this disease, which the reader will do well carefully to examine as we proceed with the symptoms, that he may be enabled to recognise it in its very earliest stage; and the moment he does recognise it, he will do well to apply for the very best advice he can get. Most of the peculiarities delineated in the cut will be sufficiently apparent before the jaws are locked, and while medicine can be administered with tolerable ease.



The jaws are unnaturally fixed, and then he observes that there is a stiffness of the neck; a difficulty in bringing the head round, and a prominence, and hardness, and unyieldingness of all the muscles of the neck; with an unusual protrusion of the head. It next occurs that the poor animal cannot bend his head. The retractor muscle (fig. *g*, p. 98) is affected by spasm, and the eye is drawn into the socket—squinting outward—and the haw protruding over a portion of it. The nostril is expanded, the ear erect, and the countenance anxious;—the back and loins are stiff, and if he is turned in his stall, the whole body turns at once like an unbending piece of wood. The muscles of the belly are also affected by spasm, and he is *tucked up* (his belly contracted and drawn up) to a strange degree. The tail is erect, and constantly quivering. The extremities are singularly fixed;—the hind-legs straddling;—the fore-legs projecting forward and outward (as some one has aptly described it) like the legs of a stool. The pulse at first not much affected, but soon becoming quick, and small, and irregular; the breathing more laborious as the disease proceeds; and the countenance wild and haggard, and expressive of extreme agony. The pain which attends the cramp of one limb will enable us to judge of that which must accompany universal spasm. If a person goes near the horse, or touches him in the slightest way, although he may be unable to move, yet the sudden quickening of the pulse will tell what the animal feels and fears. So the disease goes on for nine or ten days, until the animal is exhausted by the expenditure of nervous energy, and the continuance of torture.

If, from strength of constitution or medical treatment, he should recover, the first favourable symptom is a slight and short remission of the spasm; the time of the remission gradually lengthening, and the jaws a little relaxing; but the progress of cure is exceedingly slow, and the horse is left very weak.

Tetanus is evidently an affection of the nerves. A small fibre of some nerve has been injured, and the effect of that injury has spread to the origin of the nerve; the brain has become affected, and universal diseased action speedily follows. Locked-jaw generally arises from a wound, and oftenest a wound of a tendinous or ligamentous part; but depending not experience of the difficulty they would have in rising again. These are evident injuries of the spine, and a loss of some of the joints of the loins or back, and are without remedy; and so often is palsy. Bleeding, physicking, antimonial medicines, and stimulating embrocations, are the most likely means of cure.

RABIES, OR MADNESS.

There is another disease of the nervous system, of which we must speak—Rabies, or Madness—that incurable malady which results from the bite of a rabid or mad animal. The poison of the saliva remains in the wound for an uncertain time, varying from three to eight weeks in the horse, and then begins to produce its dreadful effects on the system. The attack of rabies (or hydrophobia, as it is commonly, but very improperly called in the horse and other quadrupeds, for they have no dread of water) is usually very sudden. The animal will go to work apparently well; all at once he will stop, tremble, heave, paw, stagger and fall. Almost immediately he will rise; draw his load a little farther; again stop, look about him, and once more fall. This cannot be confounded with megrims, because the horse is perfectly sensible. The sooner he is led home the better, for the progress of the disease is most rapid; and, if he is not immediately destroyed, he should be slung, for sometimes a state of the highest excitation speedily ensues. The horse kicks and plunges in the most violent manner; attempts furiously to seize and bite the other horses, or his attendants; "and will level with the ground every thing before him, himself sweating, and snorting, and foaming, amidst the ruins." In both the ferocious and the harmless variety of the disease, staggering and palsy of the hinder extremities soon follow. We remember to have seen a beautiful mare, sitting on her haunches, and unable to rise, yet pawing furiously with her fore-feet, and striking at every thing within her reach. The thirst is excessive, and the act of swallowing is usually performed with a forced gulping effort, and the head is, in a few instances, snatched violently from the pail. The disease rarely extends beyond the third day.

After death, there is uniformly found inflammation at the back part of the mouth, and at the top of the windpipe, and likewise in the stomach, and on the membrane covering the lungs, and where the spinal marrow first comes from the brain.

When the disease can be clearly connected with a previous bite, the sooner the animal is destroyed the better, for *there is no cure.* If the symptoms bear considerable resemblance to rabies, although no bite be suspected, the horse should at least be slung, and the medicine, if any be administered, given in the form of a drink, and with the hand well protected; because, if it should be scratched in balling the horse, or the skin should have been previously broken, the saliva of the animal is capable of communicating the disease. Several farriers have lost their lives from being bitten or scratched in the act of administering medicine to a rabid horse.

It is always dangerous to encourage dogs much about the stable, and especially if they become fond of the horses, and are in the habit of jumping up and licking them. The corners of horses' mouths are often sore from the pressure of the bit; and when a coach-dog in a gentleman's stable—and it is likely to happen in every stable, and with every dog—becomes rabid and dies, the horse too frequently follows him at no great distance of time.

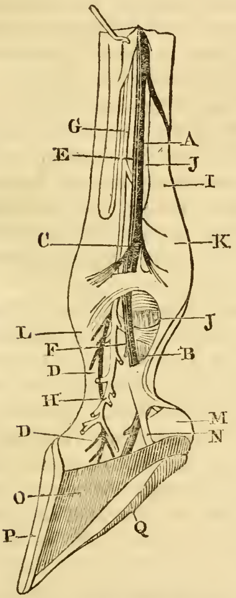
If a horse should be bitten by a dog under suspicious circumstances, he should be carefully examined, and every wound, and even the slightest scratch, well burned with the lunar caustic (nitrate of silver), and the scab should be removed and the operation repeated on the third day. The hot iron does not answer so well, and other caustics are not so manageable. In the spring of 1827, four horses were bitten near Hyde Park, by a mad dog. To one of them the lunar caustic was severely and twice applied—he lived. The red hot iron was unsparingly used on the others, and they died. The caustic must reach every part of the wound. At the expiration of the fourth month, the horse may be considered to be safe.

NEUROTOMY, OR CUTTING THE NERVE.

To enable the horse to accomplish many of the tasks we exact from him, we have nailed on his feet an iron defence. Without the shoe, he would not only be unable to travel over our hard roads, but he would speedily become useless to us. While, however, the iron protects his feet from being battered and bruised, it is necessarily inflexible. It cramps and confines the hoof, and, without great care, entails on our valuable servant disease and torture.

Among the different modes of palliating or removing the extreme pain, veterinary surgeons have lately resorted to the division of the nerve which goes to the foot. We shall now perhaps be able to understand the reason and the effect of the operation. The nerve of the leg, we have said, is derived from the union of several of the spinal nerves, and consequently it is a nerve of combined feeling and motion. The fibres connected with motion, however, are directed only to those parts which are concerned in the production of motion, and these are the muscles. By the contraction of the muscles, caused by the influence of the nerves, the limbs are moved. The bones, the blood-vessels, and other parts, are merely passive. Now the muscles of the leg of the horse do not extend below the knee. No part concerned in the production of motion is found below the knee, and the fibres of the nerve which are connected with motion are all distributed above this joint; and when we divide the nerve either on the pastern, or above the fetlock, we do not touch a single fibre connected with motion. Those which are connected with feeling are continued to the very extremity of the foot, and these are the fibres which we divide in the operation of neurotomy, or nerve-cutting. We cannot possibly interfere with the motion of the limb, but we take away the sensibility or feeling of the foot, and relieve the animal from torture; and, doing this, we not only render him a service in return for the many we have received from him, but we often and speedily abate the inflammation of the part, and give time for the use of remedies, which we should otherwise have been unable to apply, and thus possibly retain his services for many a year.

It is long before a new operation or practice, however useful or judicious it may be, is generally adopted, and, probably, the majority of our readers are some of the last to shake off the prejudices and errors of their forefathers. We have heard it said by many a farmer, and by many a farrier, too—"What! cut the nerve of the limb! Is not the nerve the very life of the limb? Does not the limb derive all its support from the nerve? Will not the foot waste away, and even the hoof drop off?" When this operation has been improperly performed, and where common sense would have forbidden it, and the horse, not only freed from pain, but from feeling too, has battered and bruised his foot, which the sensation of pain would not have permitted, and thus the structure of the foot has been injured or destroyed, and the hoof has actually dropped off after the division of the nerve,—every prejudice has been strengthened, and the operation has been censured and neglected. Now, although we have shewn that every part of the animal frame is dependent on nervous energy, we have also shewn that we do not and cannot, by this operation, injure those nerves on which nutrition depends: these are the *ganglial* nerves, which wind round the arteries and veins, and their minutest branches, and enable them to discharge their functions, and they are not, and cannot be touched in the operation of unnerving; nor can the slightest portion of nutriment be taken away from the limb. We divide only the nerve of sensation; and if we have used a little common sense, and considered whether it be a case that admits of the operation, and will probably benefit by it, we shall give relief to him who well deserves it, and will amply repay it.



A	The nerve on the inside of the off leg at the edge of the shank bone, and behind the vein and artery.
B	The continuation of the same nerve on the pastern, and proceeding downward to supply the back part of the foot with feeling.
C	The division of the nerve on the fetlock joint.
D	The branch which supplies with feeling the fore part of the foot.
E	The artery between the vein and nerve.
F	The continuation of the artery on the pastern, close to, and before the nerve.
G	The vein before the artery and nerve.
H	The same vein spreading over the pastern.
I	One of the flexor tendons, the *perforatus* (perforated).
J	The deeper flexor tendon, the *perforans* (perforating, contained within the other).
K	The tendinous band in which the flexors work.
L	One of the extensors of the foot.
M	The internal or sensible frog.
N	The posterior lateral ligament.
O	The fleshy or sensible lamina covering the coffin bone, the horny crust being removed.
P	The horny crust.
Q	The sole.

Our cut gives a view of the nerve on the inside, as it approaches the fetlock, and goes over the pastern. It will be seen that branches are given off above the fetlock, which go to the fore part of the foot, and supply it with feeling. The continuation of the nerve below the fetlock is given principally to the quarters and hinder part of the foot. The first consideration, then, with the operator is—Does he wish to deprive the whole of the foot of sensation, or is the cause of lameness principally in the hinder part of the foot, so that he can leave some degree of feeling in the fore part, and prevent that alteration in the tread and going of the horse, which the good horseman immediately detects?

The horse is cast and secured, and the limb to be operated on removed from the hobbles and extended; the hair having been previously shaved from the part. The operator then feels for the throbbing of the artery, or the round firm body of the nerve itself, on the side of the shank bone, or the larger pastern. The vein, artery, and nerve here run close together, the vein nearest to the front of the leg, then the artery, and the nerve behind. He cautiously cuts through the skin, for an inch and a half in length. The vessels will then be brought into view, and the nerve will be distinguished from them, by its being behind, and by its whiteness. A crooked needle with silk is passed under it to raise it a little; it is dissected from the cellular substance beneath, and about three quarters of an inch of it cut out, the first incision being made at the upper part, in which case the second cut will not be felt. The horse must then be turned and the operation performed on the other side, for there is a nervous trunk on both sides. The wounds are now closed with strips of adhesive plaster, a bandage placed over them, the head tied up for two days, and the animal kept rather low, and as quiet as possible. The incisions will generally rapidly heal, and in three weeks, or a month, and sometimes earlier, the horse will be fit for work.

For ring-bone;—the side cartilages becoming bony, and partial stiffness of the pastern and coffin joints, the operation of nerving will probably be useful. The sense of pain being taken away, the animal will use these parts more, and partly recover their natural action and motion. For the same reason, in old contraction of the feet, it is highly beneficial. The torture occasioned by the pressure of the horny crust on the sensible parts within being no longer felt, and the foot coming fully and firmly in contact with the ground, not only is lameness relieved, but the elasticity and form of the foot partially restored. Where there has long existed lameness unattended with heat of the foot, or alteration of shape, and the seat of which could not be ascertained, although probably existing between the shuttle bone and the back tendon which plays over it, neurotomy may be resorted to with decided advantage.

Mischief, however, will result from the operation if the pastern or coffin joints are perfectly stiff, because the concussion occasioned by the forcible contact of the foot with the ground, and unbroken by the play of the joints, must necessarily still more injure the bone. When the sole of the foot is convex or *pumiced*, the effect of neurotomy will be most destructive. The sole, scarcely able to bear the pressure of the coffin-bone forced below its natural situation, even when pain induces the animal to put his foot as gently as possible on the ground, would now be speedily worn through and destroyed. So if inflammation existed, although its pain might be removed, yet its progress would be quickened by the bruising to which the parts might be subjected, and more especially would this be the case if there were any ulceration of the ligaments or cartilages. How many cases will this include! To how many poor coach and cart-horses and hackneys might some years of usefulness and enjoyment thus be added!

The value of the operation, or the unpleasant consequences which may follow from it, depend upon the judgment of the surgeon; and that judgment being duly exercised, we regard this operation as one of the most important discoveries in horse practice in modern times.

DISEASES OF THE EYE.

The diseases of the eye constitute a very important, but a most unsatisfactory division of our work; for the maladies of this organ, although few in number, are frequent in their appearance; they are sadly obstinate, and baffle all skill. The eye of the horse appears to be naturally more disposed to disease than that of any other animal with which we are acquainted; and most assuredly there is no domestic animal, the treatment of whose diseases is so much at variance with common sense.

We have spoken of Fracture of the orbit, and its treatment. Occasionally a Wound is inflicted by a passionate or careless servant. The eye itself is rarely injured. It is placed on a mass of fat, and it turns most readily, and the prong of the fork glances off; but the substance around the eye may be deeply wounded, and very considerable inflammation may ensue. This should be abated by poultices, and bleeding, and physic; but no probe should be used, under the foolish idea of ascertaining the depth of the wound, for, from the constant motion of the eye, it is almost impossible to pass the probe into the original wound, and the effort to accomplish it will give a great deal of pain, and increase the inflammation.

The horse has occasionally a scaly eruption on the edges of the eyelids, attended with great itching, in the effort to allay which, by rubbing the part, the eye may be blemished. The nitrated ointment of quicksilver, mixed with an equal quantity of lard, may be slightly rubbed on the edges of the lids with considerable good effect.

WARTS are sometimes attached to the edges of the lids, and are a source of great irritation. When rubbed they bleed, and the common opinion is true that they are propagated by the blood. They may be taken off with a sharp pair of scissors, and their roots touched with the lunar caustic.

The HAW may be thickened, and project on the fore part of the eye. The eye is drawn back by the retractor muscle to relieve it from the painful influence of the light; and the haw being thus pushed forward, and thickened, and the neighbouring parts thickened, is unable to retract. Cooling applications, and bleeding and physic, will generally set all right. The farrier who talks of cutting out this important organ must be exceedingly ignorant.

In a very few instances long continued inflammation of the haw is followed by ulceration and eating away of the cartilage. If the Goulard lotion, and that succeeded by the white vitriol, fail to abate the inflammation or to retract the part, it may be necessary to extirpate it. The horse must be cast, and the aid of a veterinary surgeon is indispensable, for he alone can determine how much of the neighbouring membranes must likewise be removed.

COMMON INFLAMMATION OF THE EYE.

The conjunctiva is the seat of the worst disease, and which is too often destructive to the eye. We may consider inflammation of the eye under two forms—the common and manageable, and the specific and fatal. The *Common Inflammation* is generally sudden in its attack. The lids will be found swelled, the eyes partially closed, with some weeping. The inside of the lid will be red, some red streaks visible on the white of the eye, and the cornea slightly dim. This is usually connected with some degree of catarrh or cold; but it is as often unaccompanied by this, and depends on external irritation, as a blow, or the presence of a bit of hay-seed or oat-husk within the lid, and towards the outer corner where the haw cannot reach it: therefore the lids should always be carefully examined as to this possible source of the complaint. The health of the animal is generally not at all affected; he feeds well, and performs his work with his usual spirit. Cooling applications to the eye, as the Goulard's extract in the proportion of a drachm, or half an ounce of the tincture of opium, to a pint of water, with mash-diet, and gentle physic, will usually get rid of this: or the inflammation will subside without medical treatment.

SPECIFIC OPHTHALMIA, OR MOON-BLINDNESS.

Should three or four days pass, and the inflammation not be abated, we may begin to suspect that it is the true *Ophthalmia*, especially if the eye be very impatient of light, and the cornea be considerably clouded: the aqueous humor then often loses its transparency, even the iris changes its colour, and the pupil is exceedingly contracted. We have now an obstinate disease to combat, and one which will generally maintain its ground in spite of all our efforts. For three, or four, or five weeks, the inflammation will remain undiminished, or if it appears to yield on one day, it will return with redoubled violence on the next. At length, and often unconnected with any of the means we have been using, the eye begins to bear the light, the redness on the membrane of the lid and the white of the eye somewhat suddenly disappears, the cornea clears up, and the only vestige of disease which remains is a slight thickening of the lids, and apparent uneasiness when exposed to a very strong light.

If we imagine that we have got rid of the disease, we shall be sadly disappointed, for in the course of six weeks or two months, either the same eye undergoes a second and similar attack, or the other eye becomes affected. All again seems to pass over, except that the eye is not so perfectly restored, and a slight, deeply-seated cloudiness begins to appear; and after repeated attacks, and alternations of disease from eye to eye, the affair terminates in opacity of the lens or its capsule, attended with perfect blindness either of one eye or both. This affection was formerly known by the name of *moon-blindness*, from its periodical return, and some supposed influence of the moon. That planet, however, has not, and cannot have any thing to do with it.

What is the practitioner doing all this while? He is an anxious and busy, but almost powerless spectator. He foments the eyes with warm water, or applies cold lotions with the extract of lead or opium, or poultices to which these drugs may be added; he bleeds, not from the temporal artery, for that does not supply the orbit of the eye, but from the *angular vein* at the inner corner of the eye, or by scarifying the lining of the lid, or by subtracting a considerable quantity of blood from the jugular. The scarifying of the lids, which may be easily accomplished without a twitch, by exposing the inside of the lids, and drawing a keen lancet slightly over it, is the most effectual of all ways to abate inflammation, for we are then immediately unloading the distended vessels. He places his setons in the cheek, or his rowels under the jaw; and he keeps the animal low, and physics, or gives fever medicine (digitalis, nitre, and emetic tartar); or, as some have done, considering it as a constitutional disease, administers the corrosive sublimate daily in doses of a scruple. The disease, however, ebbs and flows, retreats and attacks, until it reaches its natural termination, blindness of one or both eyes.

The horse is more subject to this disease from the age of four to six years than at any other period. He has then completed his growth: he is full of blood, and liable to inflammatory complaints, and the eye is the organ attacked from a peculiar predisposition in it to inflammation, the nature or cause of which cannot be explained. Every affection of the eye appearing about this age must be regarded with much suspicion. It is a common opinion that black horses are more subject to blindness than others. We have considerable doubt about this, or rather we believe that colour has no influence either in producing or aggravating the disease.

As this malady so frequently destroys the sight, and there are certain periods when the inflammation has seemingly subsided, and the inexperienced person would be deceived into the belief that all danger is at an end, the eye should be most carefully examined at the time of purchase, and the examiner should be fully aware of all the minute indications of previous or approaching disease. They are a slight thickening of the lids, or puckering towards the inner corner of the eye; a difference in the apparent size of the eyes; a cloudiness, although perhaps scarcely perceptible, of the surface of the cornea, or more deeply seated, or a hazy circle round its edge; a gloominess of the eye generally, and dulness of the iris; or a minute, faint, dusky spot in the centre, with or without little fibres or lines diverging from it.

The cause of this inflammation is undoubtedly a strong predisposition to it in the eye of the horse, but assisted by the heated and poisoned air of many stables. Some of our readers whose stables are not too air-tight, see frequently a great deal of this disease; but if they knew its ravages where several horses are crowded together, and scarcely a breath of air admitted, they would deem themselves comparatively fortunate. The heated air has much to do with the production of the disease;—the poisoned air a great deal more; for every one must have observed, on entering a close stable early in the morning, strong fumes of hartshorn, which were painful to his eyes and caused them to water. What must be the constant action of this on the eyes of the horse? The dung of the horse, and the litter of the stables, when becoming putrid, give out fumes of volatile alkali or hartshorn; but besides this, the urine of the horse, for some purpose unknown to us, possibly to teach us to take better care of this useful servant, begins very soon after it is voided to give out an immense quantity of this pungent gas. If we are scarcely able to bear it when we stand in the stable for only a few minutes, we need not wonder at the prevalence of inflammation in the eye of the stabled horse, nor at the difficulty of abating inflammation while the eye continues to be exposed to such painful excitement. Stables are now much better ventilated than they used to be, and this disease is not so prevalent as it was fifty years ago.

The farmer may not be aware of another cause of this disease, to which his horse is more particularly exposed, viz. confinement in a dark stable. Many stables in the country have no glazed windows, but there is a flap which is open for a few hours in the day, or while the carter is employed in the stable, and when that is shut down almost total darkness prevails. Let our reader consider what are his sensations when he suddenly emerges from a dark room into the full glare of light; he is dazzled and bewildered, and some time passes before his vision is distinct. Let this be repeated several times in the day, and what will be the consequence? The sight will be disordered, and the eye irreparably injured. Then let him think of his poor horse, who often stumbles and starts through no fault of his own, although he is corrected for so doing, but because his eyes are necessarily weakened by these sudden transitions, and disposed to take on this sad inflammation with all its fatal results.

The propagation of various diseases, and this possibly more than any other, from the sire to his progeny, has not been sufficiently considered by breeders. Let a stallion that is blind, or whose sight is defective, possess every other point and quality that can be wished, yet he is worse than useless; for a very considerable proportion of his offspring will most assuredly inherit his weak eyes, or become totally blind. There is no fact better established than this.

The most frequent consequences of this disease are cloudiness of the eye, and cataract. The cloudiness is singular in its nature. It will change in twenty-four hours from the thinnest film to the thickest opacity; and as suddenly the eye will nearly regain its perfect transparency, but only to lose it, and as rapidly, a second time. The most barbarous methods have been resorted to for the purpose of removing this cloudiness. Chalk, and salt, and sugar, and even pounded glass, have been introduced into the eye mechanically to rub off the film. It was forgotten that the cloudiness was the effect of inflammation, and that means so harsh and cruel were very likely to recall the inflammation; that these rough and sharp substances must of necessity inflict excruciating pain; and that, after all, it generally is not a film on the surface of the cornea, but a dimness pervading its substance, and even sinking deep within it, and therefore not capable of being rubbed off. Where the cloudiness can be removed, it will be best effected by first abating inflammation; and then exciting the absorbents to take up the grey deposit, by washing the eye with a very weak solution of corrosive sublimate, containing not more than a grain of the sublimate to an ounce of water.

Opacity of the lens is another consequence of inflammation. A white speck appears on the centre of the lens, which gradually spreads over it, and completely covers it. It is generally so white and pearly as not to be mistaken: at other times more hazy, deceiving the inexperienced, and occasioning doubt in the mind of the professional man. We have seen many instances in which the sight has been evidently affected or almost lost, and yet a different opinion has been given by very fair judges. The eye must be exposed to the light, and yet under the kind of shelter to which we have previously referred, in order to discover the defect. The pupil of the horse is seldom black, like that of the human being, and its greyish hue conceals the recent or thin film which may be spreading over the lens.

Cataract in the eye of the horse admits of no remedy, for two obvious reasons; the retractor muscle draws the eye back so powerfully and so deeply into the socket, that it would be almost impossible to perform any operation; and, could an operation be performed, and the opaque lens removed, the sight would be so imperfect, from the rays of light not being sufficiently converged, that the horse would be worse to us than a blind one. The man who has undergone the operation of couching, may put a new lens before his eye, in the form of a convex spectacle, but we could not adapt spectacles to the eye of the horse, or fix them there.

GUTTA SERENA.

Another species of blindness, and of which we spoke when describing the retina, is Gutta Serena, commonly called the *glass eye*. The pupil is more than usually dilated;—it is immoveable and bright, and glassy. This is palsy of the optic nerve, or its expansion, the retina; and is usually produced by determination of blood to the head. We have described it as a consequence of staggers. So much pressure has been occasioned on the base of the brain, that the nerve has been injured, and its function destroyed. The treatment of Gutta Serena is quite as difficult as that of cataract. We have heard of successful cases, but we never saw one; nor should we be disposed to incur much expense in endeavouring to accomplish impossibilities. Reasoning from the cause of the disease, we should bleed and physic, and rowel. If we succeeded, it must be by constitutional treatment; but in the majority of cases, the pressure would have long ceased, although the mischief which it had effected remained. As to local treatment, the seat of disease is out of our reach.

CHAPTER VIII.

THE ANATOMY AND DISEASES OF THE NOSE AND MOUTH.

WE now proceed to the description of the *face* of the horse, so called in contradistinction from the upper part of the head, containing the brain. The *nasal bones*, or bones of the nose (*j j*, page 66, and *a*, p. 68), are connected with the frontal bones above, and with the lacrymal, *i i*, and the bones of the upper jaw, *l l*, on either side; they are united together by a plain suture, which is a continuation of the frontal, and they terminate in a point at the nostril (*f*, p. 63). They are rounded and arched above, because they are exposed to occasional violence and injury, which the arch-form will enable them best to resist; and at the base of the arch, where the main strength should be, they are overlapped by the upper jawbone, as we have described the temporal bone overlapping the base of the parietal. These bones form a principal part of the face; and the length, or shortness, and the character of the face, depend upon them. The largeness and length of these bones constitute the striking difference between the head of the cart horse and of the blood horse.

In some horses, this arch is more than usually developed, and there is, beside, a prominence or increased archedness about half-way down the nasal bones. These horses are said to have Roman noses, because this arch of the nose distinguishes the profile of some of the most celebrated of the ancient Romans. We cannot say that the breed of horses in which the Roman-nose usually occurs, possesses superior sagacity or courage; they are generally easy, good-tempered horses, excellent feeders, and hardy constitutioned, but possessing little blood. Many thorough-bred horses have a peculiarity the reverse of the Roman-nose. There is a depression or hollow about the middle of the nasal bones. Although this be a characteristic of breeding, it often accompanies an uncontrollable and vicious temper.

These bones form the roof of an important cavity (see *a*, p. 68). The sides are constituted above by the nasal bones, and, lower down, by the upper jaw-bones (*superior maxillaries*), while plates from these latter bones project and compose the palate, which is both the floor of the nose and the roof of the mouth (*t*, p. 68). Above (near fig. 8), not visible in our cut, is a bone called the *palatine*, although it contributes very little to the formation of the palate. It is the termination of the palate, or the border of the opening where the cavities of the mouth and nose meet (fig. 8). The frontal sinuses, *b*, and large vacuities in the upper jaw-bone, and in the æthmoid, *l*, and sphenoid bones, *k*, communicate with and enlarge the cavity of the nose.

This cavity is divided into two parts by a thick cartilage (*r*, p. 68). When we open the nostril, we see the membrane by which the cartilage, and the whole of the cavity of the nose is lined, and by the colour of which, much more than by that of the lining of the eyelids, we judge of the degree of fever, and particularly of inflammation of the lungs, or any of the air passages. By the sore places or ulcerations discovered on this membrane, we likewise determine on the existence of glanders. This cavity is, on either side, occupied by two bones, which, from their being rolled up somewhat in the form of a turban, are called the *turbinated* or *turban-shaped* bones, *s s*; part of the cartilage is cut away to display them. They are as thin as gauze, and perforated, like gauze, with a thousand holes. Between them are left sufficient passages for the air.

If they were unrolled they would present a very considerable surface; and on every part of them is spread the substance or pulp of the *olfactory*, or first pair of nerves. These bones, lined with delicate membranes, and covered by the olfactory nerves, are the *seat of smell:* and they are thus expanded, because the sense of smell in the horse must, to a very considerable degree, supply the place of the sense of touch and the lessons of experience in the human being. By this alone is he enabled to select, amongst the nutritive and poisonous herbage of the meadow, that which would support and not destroy him. The troops of wild horses are said to smell the approach of an enemy at a very considerable distance. In his domestic state, the horse does not examine the different food which is placed before him, with his eye, but with his nose; and if the smell displeases him, no coaxing will induce him to eat it. He examines a stranger by the smell, and, by very intelligible signs, expresses the opinion which he forms of him by this inquisition. The horse will evidently recognise his favourite groom when he has nothing else to indicate his approach but the sense of smell. These cavities are likewise organs of voice. The sound reverberates through them, and increases in loudness, as through the windings of a French horn.

The extension of the nostril at the lower part of these cavities is an important part of the face, and intimately connected with breeding, courage, and speed. The horse can breathe only through the nose. All the air which goes to and returns from the lungs must pass through the nostrils. In the common act of breathing, these are sufficiently large; but when the animal is put on his speed, and the respiration is quickened, these passages must dilate, or he will be much distressed. The expanded nostril is a striking feature in the blood-horse, especially when he has been excited and not over-blown. The sporting man will not forget the sudden effect which is given to the countenance of the hunter, when his ears become erect, and his nostrils dilate as he first hears the cry of the hounds, and snorts, and scents them afar off; and the painful and spasmed stretching of this part, in the poor over-driven post-horse, will shew how necessary it is that the passage to the lungs should be free and open. The nostril should not only be large, but the skin and substance which cover the entrance into the nose should be thin and elastic, that they may more readily yield, when the necessity of the animal requires a greater supply of air, and afterwards return to their natural dimensions. Therefore, nature, which adapts the animal to his situation and use, has given to the cart-horse, that is seldom blown, a confined nostril, and surrounded by much cellular substance, and a thick skin; and to the horse of more breeding, whose use consists in his speed and his continuance, a wider nostril, and much more flexible.

The inhabitants of some countries were accustomed to slit the nostrils of their horses, that they might be less distressed in the severe and long-continued exertion of their speed. The Icelanders do so to the present day. There is no necessity for this, for nature has made ample provision for all the ordinary and even extraordinary exertion we can require from the horse*. Some very powerful muscles proceed from different parts of the face, to the neighbourhood of the nostrils, to draw them back, and dilate them. Four of them are given in this cut, which is introduced here to complete our present subject, and which will be often referred to in the course of our work; *l*, *m*, *o*, and *p*, are muscles employed for this purpose.

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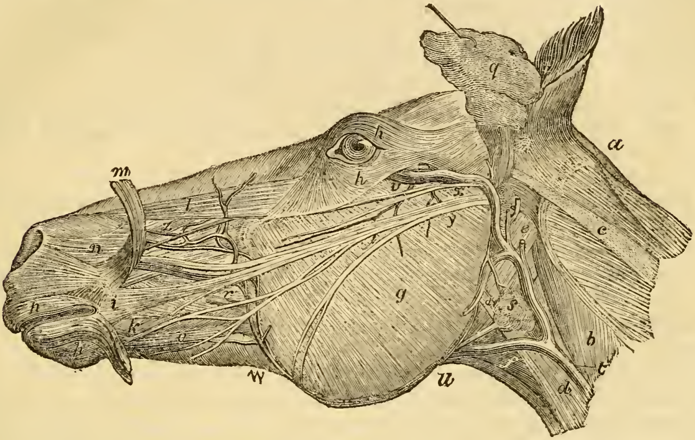
* De Grey, whose "Complete Horseman" was published in 1657, recommends that a stumbling or crippled horse should have his nose cut open, and the two tendons which go to the lip divided; and "this," says he, "will give him the use of his legs so perfectly, as that he will seldom or never trip any more." Farriers adopt many absurd and cruel practices now-a-days, but nothing half so barbarous as this.

THE MUSCLES, NERVES, AND BLOOD-VESSELS OF THE HEAD, AND UPPER PART OF THE NECK.



a The upper part of the ligament of the neck.

b The *levator humeri* (elevator of the shoulder), arising from the tubercle of the occiput, the mastoid (nipple-shaped) process of the temporal bone, and the transverse processes (cross projections) of the four first bones of the neck, and the ligament of the neck, and going to the muscles of the shoulders, and the upper bone of the arm: to draw forward the shoulder and arm; or turn the head and neck; and, when the two levators act, to depress the head.

c The tendon common to the *complexus major* (larger complicated), and *splenius* (splint-like):—to the mastoid process of the temporal, to hold up the head, or, the muscles on one side alone acting, to turn it.

d The *sterno-maxillaris*, (belonging to the breast-bone) and upper-jaw, from the cartilage in front of the chest to the angle of the lower jaw: to bend the head, or, if one only act, to bend it on one side.

e The *stylo-maxillaris*, from the styloid (pencil-shaped) or coracoid (beak-shaped) process of the occiput, to the angle of the jaw: to pull the jaw backward and open it.

f The *subscapulo hyoideus*, from under the shoulder-blade, to the body of the *os hyoides* (the bone at the root of the tongue formed like a Greek u, υ): to draw back that bone.

g The *masseter* (chewing); a most powerful muscle, constituting the cheek of the horse:—from the upper jaw-bone into the rough surface round the angle of the lower:—in conjunction with the temporal muscle to close the mouth and chew the food.

h The *orbicularis* (circular) surrounding the eye and closing the lids.

i The *zygomaticus*, from the zygomatic arch and masseter to the corner of the mouth, to draw back the angle of the mouth.

k The *buccinator* (trumpeter), from the inside of the mouth and cheeks, to the angle of the mouth, to draw it back.

l The *nasalis labii superioris* (belonging to the nose and upper lip), from a depression at the junction of the superior maxillary and malar bones, to the angle of the nostril:—to raise the lip, and dilate the nostrils.

m *Dilator naris lateralis* (side dilator of the nostril), reversed to shew the vessels and nerves which it covers, going from the covering of the nasal and frontal bones, to the angle of the mouth, and side of the nostril:—to retract the upper lip and dilate the nostrils.

n *Dilator magnus* (great dilator), assisting in the same office.

o *Depressor labii inferioris* (puller down of the under lip), to the sides of the under lip: to pull it down.

p *Orbicularis oris* (circular muscle of the mouth), surrounding the mouth: to close the lips, and dilate the nostrils.

q The upper portion of the parotid gland (gland near the ear) reversed, to shew the blood-vessels and nerves beneath it.

r The parotid duct piercing the cheek, to discharge the saliva into the mouth.

s The maxillary gland (gland of the lower jaw) with its duct.

t The jugular (neck) vein, after the two branches have united.

u At this letter, the submaxillary artery, a branch of the jugular and the parotid duct pass under and within the angle of the lower jaw; they come out again at *w*, and climb up the cheek to be distributed over the face.

v The vein and artery, passing under the zygomatic arch.

x A branch of the fifth pair, the sensitive nerve of the face, emerging from under the parotid gland.

y The main branch of the *portio dura* (hard portion) of the seventh pair, the *motor* (moving) nerve of the face coming out from beneath the parotid gland, to spread over the face.

z Branches of both nerves, with small blood-vessels.

There are also four distinct cartilages attached to the nostrils, which, by their elasticity, bring back the nostrils to their former dimensions, as soon as the muscles cease to act. The bones of the nose (*a a*, p. 66, and *f*, p. 63), are also sharpened off to a point, to give wider range for the action of the muscles; while the cartilages are so contrived, as not only to discharge the office we have mentioned, but to protect this projection of bone from injury.

There are two circumstances, which, more than any others, will enable the veterinary surgeon, and the owner of a horse, accurately to judge of the character and degree of many diseases, and to which very few pay sufficient attention; these are the pulse, of which we shall presently speak, and the colour of the membrane of the nose, at which we have hinted, a few pages back, and of which we would again remind the reader. It is the custom of most veterinary surgeons, and of almost every horseman who takes any pains to ascertain for himself the state of his sick horse, to turn down the under eyelid, and to form his opinion by the colour which its lining presents. If it be very red, there is considerable fever;—if it be of a pale pinkish hue, there is little danger. The nose is more easily got at;—the surface presented to the view is more extensive;—the sympathy with almost all the important organs is greater;—and the changes produced by disease are more striking and more conclusive. Let the reader first make himself well acquainted with the uniform pale pink appearance of that portion of the membrane which covers the lower part of the cartilaginous partition between the nostrils, when the horse is in health, and quiet; then the increased blush of red, betokening some excitement of the system;—the streaked appearance of inflammation commenced, and threatening to increase—the intense florid red, of acute inflammation;—the pale ground with patches of vivid red, shewing the half subdued, but still existing fever; the uniform colour, although somewhat redder than natural, predicting a return to a healthy circulation; the paleness approaching to white, marking the stage of debility, and sometimes intermingled with radiations of crimson, inducing the suspicion of lurking mischief; and the dark livid colour of approaching stagnation of the vital current: these, with all their shades of difference, will be guides to his opinion and treatment, which every one, who has studied them, will highly appreciate.

NASAL GLEET, OR DISCHARGE FROM THE NOSE.

The most frequent disease of this cavity is an increased and thicker discharge of fluid from the nose. It may be properly called a NASAL GLEET. There is a constant secretion of fluid to lubricate and moisten the membrane that lines the cavity of the nose, which, under catarrh or cold, is increased in quantity, and altered in appearance and consistence. This will properly belong to our account of catarrh or cold; but that to which we immediately refer is a continued and oftentimes profuse discharge when every symptom of catarrh and fever has passed away; an almost incredible quantity of thickened mucus, of different colours:—if the horse is at grass, almost as green as the food on which he lives;—or, if he be stabled, white, straw-coloured, brown, or even bloody, and sometimes evidently mingled with matter or pus; and either constantly running, or snorted out in masses many times in the day; teasing the horse, and a perfect nuisance in the stable, and to the rider. We have known this continue several months, and eventually destroy the horse.

If the discharge be not offensive to the smell, nor mixed with any matter, it is probably merely an increased and somewhat vitiated secretion from the cavities of the nose; and, all fever having disappeared, will frequently yield to small doses of blue vitriol, from one to two drachms, and given twice in the day. If fever or cough remain, the cough medicine which will hereafter be described must be combined with the tonic. If the discharge be mingled with pus, and very offensive, the vegetable tonics, gentian and ginger, may be added to the copper in doses of two drachms of the former, and one of the latter; but there is then reason to apprehend that the discharge will not be controlled, and will terminate in glanders. Turning into a salt marsh will occasionally effect a cure, when both the mineral and the vegetable tonics have failed.

GLANDERS.

The next and most formidable of all the diseases to which the horse is subject, is GLANDERS. It is described by writers fifteen hundred years ago, and it was then, and is now, not only a loathsome, but an incurable disease; we shall therefore principally confine ourselves to the consideration of its symptoms, nature, and causes, and prevention, and degree of contagion, and these will afford too much matter of interest to the farmer.

If we could obtain an authentic history of the glandered horse, we should find that, in the majority of instances, if the disease were bred in him, he had been dull, off his feed, losing flesh, and his coat staring; and that these appearances had for several weeks preceded the characteristic symptoms of glanders. These symptoms, however, may lead to, or be the causes of other diseases, or they may pass away, and the horse may return to perfect health. That which would be considered as the earliest, and an unquestionable symptom of glanders, would be an increased discharge from one or both nostrils; different from the discharge of catarrh, because it is usually lighter and clearer in its colour, and more glutinous or sticky. When rubbed between the fingers it has, even in an early stage, a peculiar, clammy, bird-limy feel. It is not discharged occasionally and in large quantities, like the mucus of catarrh, but it is constantly running from the nostril.

It is a singular circumstance, for which no satisfactory account has yet been given, that when one nostril alone is attacked, it is in a great majority of cases the near or left. M. Dupuy, the director of the veterinar school at Toulouse, gives a most singular account of this. He says that out of eight hundred cases of glanders that came under his notice, only one was affected in the right nostril.

This discharge, in cases of infection, may continue, and in so slight a degree as to be scarcely perceptible, for many weeks or months before the health and capabilities of the horse seem to be injured. It will remain for a long time almost transparent, yet gluey; and then it will begin to be mingled with pus; retaining, however, its sticky character, and being rarely offensive in the early stages. The constant flow of this secretion, and its stickiness, with the absence of cough either before or during the discharge, will be the only symptoms. In process of time, however, pus mingles with the discharge, and then another and a characteristic symptom appears. Some of this is absorbed, and the neighbouring glands become affected; and, if there be discharge from both nostrils, the glands within the under jaw will be on both sides enlarged. If the discharge be from one nostril only, the swelled gland will be found on that side alone. Glanders, however, will frequently exist at an early stage without these swelled glands, and some other diseases, as catarrh, will produce them. Then we must look out for some peculiarity about these glands, and we shall readily find it. The swelling may be at first somewhat large and diffused, but the surrounding enlargement soon goes off, and one or two small distinct glands remain; and they are not in the centre of the channel, but *adhere closely to the jaw on the affected side.*

The membrane of the nose may now be examined, and will materially guide our opinion. It will either be of a dark purplish hue, or almost of a leaden colour, or of any shade between the two; or, if there be some of the redness of inflammation, it will have a purple tinge; but there will never be the faint pink blush of health, or the intense and vivid red of usual inflammation. Spots of ulceration will probably appear on the membrane covering the cartilage of the nose—not simple sore places, or streaks of abrasion, and quite superficial, but small ulcers usually approaching to a circular form, deep, with the edges abrupt and prominent. When these appearances are observed, there can be no doubt about the matter. Care should be taken, however, to ascertain that these ulcers do actually exist, for spots of mucus adhering to the membrane have been more than once taken for them. The finger should, if possible, be passed over the supposed ulcer, to determine whether it can be wiped away; and it should be recollected, as we have already hinted when describing the duct that conveys the tears to the nose, that the orifice of that duct, just within the nostril, and on the inner side of it, has been mistaken for a cancerous ulcer. This orifice is on the continuation of the common skin of the muzzle which runs a little way up the nostril, while the ulcer of glanders is on the proper membrane of the nose above; and the line of separation between the two is evident on the slightest inspection.

It is proper to state that this discharge has continued unattended by any other disease, or even by ulceration of the nostril for two or three years, and yet the horse was decidedly glandered from the beginning, and capable of propagating the malady.

When ulcers on the membrane of the nose have appeared, the constitution will be evidently affected. The horse will lose flesh; his belly will be tucked up; his coat will be unthrifty, and readily come off; cough will be heard; the appetite will be impaired; the strength will fail; the discharge from the nose will grow more purulent, discoloured, bloody, stinking; the ulcers in the nose will be larger and more numerous; and, the air-passages being obstructed, a grating, choking noise will be heard at every act of breathing. The lungs are now diseased; they are filled with tubercles or ulcerations; and the horse at length dies, an emaciated and loathsome object.

The symptoms frequently vary, and to a most puzzling degree. The discharge will be so slight as scarcely to be perceived, and known only by its stickiness; and the glands will not be in the least degree enlarged. At other times a very small enlarged gland may be found, adhering to the jaw, and may be stationary month after month, and the surgeon may be told that there has never been discharge from the nose. He will, however, be wrongly informed here; it has most assuredly existed, although perhaps to no great degree, at some former period, and he will generally without much difficulty discover it then, although perhaps in so small a quantity that the groom or carter will deny its existence; and he will principally satisfy himself with respect to it, by its gluey feeling.

Glanders have often been confounded with *strangles*, and by those who ought to have known better. Strangles are peculiar to young horses. The early stage resembles common cold, with some degree of fever and sore throat; generally with distressing cough, or at least frequent wheezing; and when the enlargement appears beneath the jaw, it is not a single small gland, but a swelling of the whole of the substance between the jaws; growing harder towards the middle; and after a while appearing to contain a fluid, and breaking. In strangles the membrane of the nose will be intensely red, and the discharge from the nose profuse, and purulent, or mixed with matter almost from the first; and when the tumour has burst, the fever will abate, and the horse will speedily get well.

Should the discharge from the nose continue for a considerable time after the horse has recovered from strangles, as it sometimes does, there is no cause for fear. Simple strangles need never degenerate into glanders. Good keep, and small doses of the blue vitriol given internally, will gradually make all right.

Glanders have been confounded with catarrh or cold, but the distinction between them is plain enough. Fever accompanies cold, and loss of appetite, and sore throat (the quidding of the food, and gulping of the water are sufficient indications of the latter of these); the discharge from the nose is profuse, and perhaps purulent; and the glands under the jaw, if swelled, are moveable, and there is a thickening around them, and they are tender and hot. With proper treatment the fever abates; the cough disappears; the swellings under the throat subside, and the discharge from the nose gradually ceases, or, if it remain, it is usually very different from that which characterizes glanders. In glanders, there is seldom cough of any consequence, and, generally, no cough at all.

A running from the nose, small in quantity, and from the smallness of its quantity drying about the edges of the nostril, and so presenting some appearance of stickiness, will, in a few cases, remain after severe catarrh, and especially after the influenza of spring; and these have gradually assumed the character of glanders, and more particularly when they have been accompanied by enlarged glands and ulceration in the nose. Here the aid of a judicious veterinary surgeon is indispensable; and he perhaps will experience considerable difficulty in deciding the case. One circumstance will principally guide him. No disease will run on to glanders which has not, to a considerable and palpable degree, impaired and broken down the constitution; and *every disease that does this will run on to glanders.* He will look then to the general state and condition of the horse, as well as to the situation of the glands, the nature of the discharge and character of the ulceration.

If, after all, he is in doubt, an experiment may be resorted to, which wears indeed the appearance of cruelty, and which only the safety of a valuable animal, or of a whole team, can justify: he will inoculate an ass or a horse already condemned to the hounds with the matter discharged from the nose. If the horse be glandered, the symptoms of glanders or farcy will appear in the inoculated animal in the course of a few days.

The history we have given of the symptoms of glanders will pretty clearly point out its nature. It is an affection of the membrane of the nose. Some say that it is the production of tubercles, or minute tumours in the upper cells of the nose, which may long exist undetected, and hard to be detected except by a scarcely perceptible running from the nostril, caused by the slight irritation which they occasion. These tubercles gradually become more numerous; they cluster together, suppurate, and break; and small ulcerations are formed. The ulcers discharge a poisonous matter, which is absorbed and taken up by the neighbouring glands, and which, with greater or less rapidity, vitiates the constitution of the animal, and is capable of communicating the disease to others. Other surgeons content themselves with saying that it is an inflammation of the membrane of the nose, which may assume an acute or chronic form, or in a very short time, or exceedingly slowly, run on to ulceration.

The malady proceeds as we have already described it, but, before its termination, becomes connected with farcy. Few horses die of glanders without exhibiting some appearance of farcy; and farcy, in its latter stages, is almost invariably accompanied by glanders:—*they are different forms or stages of the same disease.*

There can be no doubt that the membrane of the nose is the original seat of glanders; that the disease is for a time purely local; that the inflammation of the tubercles must proceed to suppuration before that matter is formed on which the poisoning of the constitution depends; that the whole circulation does at length become empoisoned; and that the horse is destroyed by the general irritation and disease produced.

Glanders may be either bred in the horse, or communicated by contagion. What we have further to remark on this malady will be arranged under these two heads.

Improper stable management we believe to be a far more frequent cause of glanders than contagion. The air which is necessary to respiration is changed and empoisoned in its passage through the lungs, and a fresh supply is necessary for the support of life. That supply may be sufficient, barely to support life, but not to prevent the vitiated air from again and again passing to the lungs, and producing irritation and disease. The membrane of the nose, possessed of extreme sensibility for the purposes of smell, is easily irritated by this poison, and close and ill-ventilated stables oftenest witness the ravages of glanders. Professor Coleman relates a case, which proves to demonstration the rapid and fatal agency of this cause. "In the expedition to Quiberon, the horses had not been long on board the transports, before it became necessary to shut down the hatchways (we believe for a few hours only); the consequence of this was, that some of them were suffocated, and that all the rest were disembarked either glandered or farcied*."

In a close stable, the air is not only poisoned by being repeatedly breathed, but there are other and more powerful sources of mischief. The dung and the urine are suffered to remain fermenting, and giving out injurious gases. In many dark and ill-managed stables, a portion of the dung may be swept away, but the urine lies for days at the bottom of the bed, the disgusting and putrifying nature of which is ill concealed by a little fresh straw which the lazy horsekeeper scatters over the top.

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* See Percival's excellent Lectures on the Veterinary Art, vol. iii. p. 455.

The stables of the gentleman are generally kept hot enough, and far too hot, although, in many of them, a more rational mode of treatment is beginning to be adopted; but they are lofty and roomy, and the horses are not too much crowded together, and a most scrupulous regard is paid to cleanliness. Glanders seldom prevail there. The stables of the farmer are ill-managed and filthy enough, and the ordure and urine sometimes remain from week to week, until the horse lies on a perfect dunghill, while there is no declivity to drain away the moisture, nor any regular pavement to prevent it from soaking into the earth, nor any water to clean even the surface, but the only instrument of purification is an old stumped broom. Glanders seldom prevail there; for the same carelessness which permits the filth to accumulate, leaves many a cranny for the wind to enter, and sweep away the deleterious fumes from this badly roofed and unceiled place.

The stables of the horse-dealer are hot enough; but a principle of strict cleanliness is enforced, for there must be nothing to offend the eye or the nose of the customer; and there glanders are seldom found: but if the stables of many of our post-horses, and of those employed on our canals, be examined, almost too low for a tall horse to stand upright—too dark for the accumulation of filth to be perceived—too far from the eye of the master,—ill-drained, and ill-paved,—and governed by a false principle of economy, which begrudges the labour of the man, and the cleanliness and comfort of the animal;—these will be the very hot-beds of the disease, and in many of these establishments it is an almost constant resident.

When speaking of inflammation of the eye, and the effect of ill-ventilated stables in producing it, we remarked that the urine of the horse contained an unusually large quantity of hartshorn; that the litter wetted by it was disposed most rapidly to ferment, and that the gases extricated must be extremely prejudicial to so delicate an organ. It may, then, be easily imagined that the constant presence of those pungent fumes, and the irritation which they would cause on that membrane which is the very seat of smell, must predispose for, and often generate a disease which is primarily an affection of this membrane.

Glanders may be produced by any thing that injures, or for a length of time acts upon, and weakens the vital energy of this membrane. They have been known to follow a fracture of the bones of the nose. They have been the consequence of violent catarrh, and particularly the long continued discharge from the nostrils, of which we have spoken. They have been produced by the injection of stimulating and acrid substances up the nostril; and every thing that weakens the constitution generally, will lead to glanders. It is not only from bad stable-management, but from the hardships which they endure, and the exhausted state of their constitution, that post and machine-horses are so subject to glanders; and there is scarcely an inflammatory disease to which the horse is subject, that is not occasionally wound up and terminated by the appearance of glanders.

Glanders, however, are highly contagious. The farmer cannot be too well aware of this; and, considering the degree to which they often prevail, the legislature would be justified in interfering by some severe enactments, as they have done in the case of the small-pox in the human subject.

The early and marked symptom of glanders is a discharge from the nostrils of a peculiar character; and if that, even before it becomes purulent, be rubbed on a wound, or on a mucous surface, as the nostrils, it will produce a similar disease. Glanders are not communicated by the air or breath. If the division between two horses were sufficiently high to prevent all smelling and snorting at each other, and contact of every kind, and they drunk not out of the same pail, a sound horse might live for years, uninfected, by the side of a glandered one. The matter of glanders has been mixed up into a ball, and given to a healthy horse, without effect; yet in another experiment of the same kind, the poor animal died. The mouth or gullet had probably some small wounds or ulcers in it. Some horses have eaten the hay left by those that were glandered, and no bad consequence has followed; but others have been speedily infected. The glanderous matter must come in contact with a wound, or fall on some membrane, thin and delicate like that of the nose, and through which it may be absorbed. It is easy, then, accustomed as horses are to smell each other, and to recognize each other by the smell; eating out of the same manger, and drinking from the same pail, to imagine that the disease may be very readily communicated. One horse has passed another when he was in the act of snorting, and has become glandered. Some fillies have received the infection, from the matter blown by the wind across a lane, when a glandered horse, in the opposite field, has claimed acquaintance by neighing or snorting. It is almost impossible for an infected horse to remain long in a stable with others, without irreparable mischief.

If some persons underrate the danger, it is because the disease may remain unrecognized in the infected horse for some months, or even years; and therefore when it appears, it is attributed to other causes, or to after inoculation. We would deeply impress it on the mind of the farmer, that no glandered horse should be employed on his farm in any kind of work, or permitted to remain for a day on his premises: nor should a glandered horse be permitted to work on any road, or even to pasture on any field. He may be capable of work for years after the disease has become undoubted, but mischief may so easily and extensively be effected, that the public interest demands that every infected animal should be summarily destroyed, or given over for experiment to a veterinary surgeon, or recognized veterinary establishment.

Our opinion of the treatment of glanders is implied in what we have just stated. There are a few instances of the spontaneous cure of chronic glanders, or glanders long established and slow in their progress. The discharge has existed for a considerable time; at length it has gradually diminished, and has ceased without medical treatment: but in the majority of these supposed cases, the matter was only pent up for a while, and then, bursting from its confinement, flowed again in double quantity: or if glanders have not reappeared, the horse, in eighteen or twenty-four months, has become farcied, or consumptive, and died. We view these cures with much suspicion: but even allowing that some have occurred, they are so few and far between, that our expressed opinion of the incurable nature of the disease, in the present state of veterinary knowledge, is scarcely affected. As for medicine, there is scarcely a drug to which a fair trial has not been given, and many of them have had a temporary reputation; but they have passed away, one after the other, and are no longer used. The blue vitriol and the Spanish-fly have held out longest, and in a few cases, either nature, or these medicines, have done wonders;

but, in the majority of instances, they have palpably failed. Where the life of a valuable animal is at stake, and the owner takes every precaution to prevent infection, he may subject the horse to medical treatment; but we indignantly object to the slitting of the nostril, and scraping of the cartilage, and searing of the gland, and firing the frontal and nasal bones, and to those injections of pepper and mustard, corrosive sublimate and vitriol, by which the horse has been tortured, and the practitioner disgraced. At the veterinary school, and by veterinary surgeons, it will be most desirable that every experiment should be tried to discover a remedy for this pest; but, in ordinary instances, he is not faithful to his own interest or that of his neighbours, who does not remove the possibility of danger in the most summary way.

Supposing that glanders have made their appearance in the stables of a farmer, is there any danger after he has removed or destroyed the infected horse?—certainly there is, but not to the extent that is commonly supposed. There is no necessity for pulling down the racks and mangers, or even the stable itself, as some have done. The poison resides not in the breath of the animal, but in the nasal discharge, and that can only reach certain parts of the stable; and if the mangers, and racks, and bales, and partitions, are first well scraped, and next scoured with soap and water, and then thoroughly washed with a solution of the chloride of lime, (one pint of the chloride to a pailful of water,) and the walls are lime-washed, and the head-gear burned, and the clothing baked and washed, and the pails new painted, and the iron-work exposed to a red heat, all danger will cease.

The tricks which some dealers resort to at fairs and markets, in order to conceal the existence of glanders, are most infamous, and should be visited with the severest penalty of the law. Having given the horse a brushing gallop, that he may thoroughly clear the nose, some of them blow powdered alum up the nostrils a little while before he is shewn; others use white vitriol; and although the horse may be sadly tortured, about which they care nothing, the discharge is for some hours stayed. Others roll up a pledget of tow, and introduce it into the nostril, sufficiently high to escape common observation. Both these tricks may be discovered by the uneasiness of the animal, and his repeated efforts to sneeze, as well as by his general appearance, and if the disease be far advanced, most assuredly by the red or raw appearance of the nose, and by the stinking breath.

Happy should we be, if we could say any thing satisfactory of the *prevention* of glanders. The danger from exposure to infection can scarcely be avoided by those who travel much, and whose horses must stand in stables the inmates of which are so promiscuous, and so frequently changed. Although we cannot prevent contagion, we have more power in preventing the disease from occurring without contagion, and that is a point of importance, at least if the opinion of Professor Coleman be correct, that not one horse in a thousand receives the disease from contagion. To this, however, we cannot subscribe, for not only the history of cavalry regiments, but the experience of every breeder and proprietor of horses will prove the infectious nature of the complaint.

No fact is more certain, than that he who will keep a glandered horse in his stable, or work him in his team, will sooner or later lose the greater part of his stud. However, the generation of the disease may certainly be much prevented, and the first and most effectual mode of prevention will be to keep the stables cool and well ventilated, for the hot and poisoned air of low and confined stables is one of the most prevalent causes of glanders.

Next to ventilation stands cleanliness; for the foul air from the fermenting litter, and urine and dung, must not only be highly injurious to health generally, but irritate and predispose to inflammation that delicate membrane, which is the primary seat of the disease. If to this be added regular exercise, and occasional green meat during the summer, and carrots in the winter, we shall have stated all that can be done in the way of prevention. The farmer's horse in his cool or cold stable, and during the greater part of the year running loose when not at work, would be exempt from glanders, if, at the market and the fair, he were not so much exposed to contagion. In truth, glanders may be considered as the consequence of the stabling of the horse. In South America and in Arabia they are unknown; but wherever the European plan of stabling has been introduced, glanders have followed in its train: and therefore if any means are resorted to for the cure of glanders, the first, and perhaps the only effectual one would be to remove every exciting cause of the disease; to restore the horse almost to a state of nature; to turn him out for a long time, or at least to throw open his stable as much as the season and the weather will permit. Experience, however, tells us, that, although the symptoms have disappeared when the exciting causes of disease have been removed, and the horse has returned to his stable after a twelvemonth's run apparently sound, every symptom has gradually shewn itself again when these causes have been once more called into action.

FARCY.

Farcy is intimately connected with glanders; they will run into each other, or their symptoms will mingle together, and before either arrives at its fatal termination its associate will almost invariably appear. An animal inoculated with the matter of farcy will often be afflicted with glanders, while the matter of glanders will frequently produce farcy. They are different types or stages of the same disease. There is, however, a very material difference in their symptoms and progress, and this most important of all, that while glanders are generally incurable, farcy, in its early stage and mild form, may be successfully treated.

Veterinary writers tell us that it is a disease of the absorbents in the skin. The small arteries are employed in building up and nourishing the various parts of the body; and another set of vessels are busied in taking up and carrying away that which is worn out and useless. There is no part of the body on which thousands of these little tubes do not open. Those of the skin are not only employed in removing useless materials, but in taking up various substances, and principally fluids which may be in contact with the skin. The little vessels which are thus occupied, collect together and form larger branches, which run in company with the superficial veins, and therefore farcy was once supposed to be a disease of the veins, and the tumours by which it is characterized accompany the course of the veins. The poison which they take up produces inflammation in them, which gradually spreads along the absorbent, and causes it to swell.

These vessels, small as they are, contain valves, like those in the common pump, which permit the fluid to pass one way, but prevent its return. The inflammation, which pursues the natural course of the fluid through these tubes, that is, towards the reservoir into which it is thrown before it enters the heart, seems to be arrested by these valves, and they inflame and swell; and therefore the first indication of this disease, even before any drooping, or loss of condition, or of appetite, is generally the appearance of little tumours—*farcy buds*—close to some of the veins, following the course of the veins, and connected together by a kind of cord, which farriers call *corded veins.* When they are few and small they may possibly exist for several weeks without being observed; but at length they increase in number and in size, and become painful and hot, and some of them begin to ulcerate. They appear usually about the face or neck, or inside of the thigh, and in the latter case there is some general enlargement of the limb, and lameness.

In some cases, however, the horse will droop for many a day before the appearance of the *buttons* or *farcy buds;*—his appetite will be impaired;—his coat will stare;—he will lose flesh. The poison is evidently at work, but has not gained sufficient power to cause the absorbents to swell. In a few instances these buds do not ulcerate, but become hard and difficult to disperse. The progress of the disease is then suspended, and possibly for many months the horse will appear to be restored to health; but he bears the seeds of the malady about him, and, all at once, the farcy assumes a virulent form, and hurries him off. These buds have sometimes been confounded with the little tumours or lumps of *surfeit.* They are generally higher than these tumours;—not so broad;—have a more knotty feel, and are principally found on the inside of the limbs, instead of the outside.

The increase of these buds marks the progress of the disease, and that progress is retarded by the resistance of these valves. The ulcers spread around, and are cured with considerable difficulty. Larger tumours appear in the groin and between the fore-leg, and ulcerate and spread, and the hollows and burrowings run deep in every direction, and the horse becomes a miserable and loathsome object. Glanders speedily appear, and death ensues.

Few things are more unlike, or more perplexing, than the different forms which farcy assumes at different times. One of the legs, and particularly one of the hinder-legs, will suddenly swell to an enormous size. At night the horse will appear to be perfectly well, and, in the morning, one leg will be three times the size of the other, with considerable fever, and scarcely the power of moving the limb.

We do not mean that enlargement of the hind leg, with red shining skin, and exudation of fluid on the skin, reaching from the fetlock to the heel, round and smooth, very painful, attended with extreme lameness, and which the groom calls a farcy humour. This will yield to frequent fomentation, and a good dose of physic. It is effusion of fluid beneath the skin, from want of exercise and over-feeding. The enlargement of farcy occupies more of the limb, and presents an uneven surface, with sudden projections and depressions, and betrays in some part the corded absorbent, and the inflamed and swelled valve.

At other times the head will be subject to this enlargement—the muzzle will particularly swell, and a stinking discharge will issue from the nose. Sometimes the horse will gradually lose flesh and strength; he will be hide-bound—mangy eruptions will appear in different parts; the legs will swell; cracks will appear at the heels, and the inexperienced person may conceive it to be a mere want of condition combined with grease.

Farcy, like glanders, springs from infection, or from bad stable management. It is produced by all the causes which give rise to glanders; but with this difference, that it is more frequently generated, and is sometimes strangely prevalent in particular districts. It will attack, at the same time, several horses in the same ill-conducted stable, and others in the neighbourhood, who have been exposed to the same predisposing causes. The practitioner is always afraid of seeing too much of this disease when he meets with one case of farcy, where there has been gross inattention to the horses. Some have denied that it is a contagious disease. They must have had little experience. It is true that the matter of farcy must come in contact with a wound, or sore, in order to communicate the disease; but accustomed as horses are to nibble and play with each other, and sore as the corners of the mouth are frequently rendered by the bit, it is easy to imagine that this may often be effected; and experience tells us, that a horse having farcy-ulcers cannot be suffered to remain with others without extreme risk. We recollect an instance in which virulent and fatal farcy was communicated by a scratch from the currycomb, which had been previously used on a glandered horse.

The treatment of farcy varies with the form it assumes. In the button or bud farcy, a mild dose of physic should be first administered. The buds should be then carefully examined, and if any of them have broken, the budding iron, of a dull red heat, should be applied to them; or if matter should be felt in them, shewing that they are disposed to break, they should be penetrated with the iron. These wounds should be daily inspected, and if, when the slough of the cautery comes off, they look pale, and foul, and spongy, and discharge a thin matter, they should be frequently washed with a lotion, composed of a drachm of corrosive sublimate dissolved in an ounce of rectified spirit; the other buds should likewise be examined, and opened with the iron as soon as they evidently contain matter. When the wounds begin to look red, and the bottom of them is even and firm, and they discharge a thick white or yellow matter, the friar's balsam will speedily heal them. As, however, the constitution is now tainted, local applications will not be sufficient, and the disease must be attacked by internal medicines, as soon as the physic has ceased to operate. The corrosive sublimate will be the best alterative, and may be given in doses of ten grains, gradually increased to a scruple, with two drachms of gentian and one of ginger, and repeated morning and night until the ulcers disappear, unless the horse is violently purged, or the mouth becomes sore, when a drachm of blue vitriol may be substituted for the corrosive sublimate. During this, the animal should be placed in a large box, with a free circulation of air; and green meat, or carrots, the latter more particularly, should be given him, with a fair allowance of corn. If he could be turned out during the day, it would be advantageous; but at all events he should be daily exercised. It is related by Mr. Blaine, that a horse so reduced as not to be able to stand, was drawn into a field of tares, and suffered to take his chance: the consequence was, that when he had eaten all within his reach, he was able to rise and search for more, and eventually recovered.* In an early stage of the disease, and if glanders have not appeared, this treatment will frequently succeed. If, after the wounds have healed, the absorbents should continue to be corded, a blister, or light firing, will probably be serviceable.

It should be remembered, that a horse which has experienced one attack of farcy will be very subject to a relapse, and, therefore, should be regarded with a watchful eye, and occasional alteratives of Æthiop's mineral, with turpentine, in the proportions of one drachm of the former and four of the latter, made into a ball with linseed meal, should be given, and green meat or carrots, when circumstances will permit.*

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* Blaine's Veterinary Outlines, p. 467.

In the species of farcy attended with enormous swelling, it will be prudent to bleed moderately as well as to physic. The iron will not be necessary, but the same alterative medicine will be useful, and the leg should be frequently fomented with warm water. In both cases, although the air should be fresh and cool, the horse should be warmly clothed.

The WATER FARCY, confounded by name with the common farcy, and by which much confusion has been caused and a great deal of mischief done, is a dropsical affection of the skin, either of the chest or of the limbs generally, and belongs to another part of our subject.

A tumour termed a POLYPUS sometimes occupies one of the nostrils. It will grow to a very large size, obstructing the breathing, and sadly annoying the horse. As this can only be removed by an operation, which a veterinary surgeon alone is competent to perform, we do not describe it particularly.

THE LIPS.

The *lips* of the horse are far more important organs than many suppose. They are, in a manner, the hands of the horse; and if any one will take the trouble to observe the manner in which he gathers up his corn with them, and collects together the grass before he divides it with his nippers, he will be satisfied that the horse would be no more able to convey the food to his mouth without them, than the human being could without his hands. This has even been put to the test of experiment. The nerves which supply the lips were divided in a poor ass, to illustrate some point of physiology. The sensibility of the lips was lost, and he knew not when he touched his food with them; the motion of the lips was lost, and he could not get the oats between his teeth, although the manger was full of them; at length, driven by hunger, he contrived to lick up a few of them with his tongue, but when they were on his tongue, the greater part of them were rubbed off before he could get them into his mouth. It is on account of this use of the lips, that the faces of all quadrupeds are so lengthened that the lips may be brought into contact with the food, without inconvenience or injury to other parts of the face. Several muscles go to the lips from different parts of the jaw and face. Some of them are shewn in the cut, p. 119. The orbicularis or circular muscle, *p*, employed in pushing out the lips, and closing them, and enabling the horse to seize and hold his food, is particularly evident; and in our explanation of the cut, the action of other muscles, *i*, *k*, *m*, and *o*, was described. The nerves likewise, *y*, taking their course along the cheek, and principally supplying the lips with the power of motion, and those, *z*, proceeding from the foramen or hole in the upper jaw, deserve attention.

The lips are composed of muscles for the sake of strength, and of a multitude of small glands, which secrete a fluid that covers the inside of the lips and the gums, in order to prevent friction, and likewise furnishes a portion of the moisture so necessary for the proper chewing of the food. The skin covering the lips is very thin, because, if these are the hands of the horse, they should possess considerable feeling; and for the same purpose likewise, they are scantily covered with hair, and that hair is fine and short; and long hairs or feelers, called the beard, are superadded for the same purpose. The horse is guided and governed principally by the mouth, and therefore the lips are endowed with extraordinary sensibility, so that the animal feels the slightest motion of the hand of the rider or driver, and, as it were, anticipates his very thoughts. The *fineness* or *goodness of the mouth* consists in the exquisite feeling of the mouth, and depends on the thinness of this membrane. We shall say more of this, when we have described the lower jaw and palate.

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* The old farriers had a strange and barbarous way of attempting to cure the farcy They mixed together a variety of stimulating drugs, and sewed them in the horse's ear, and set him to hard work on straw and water.

The lips of the horse should be thin, if the beauty of the head be regarded, for if they are loaded with fat they cannot be so sensible as they ought to be: yet, although thin, they should evidently possess power, and be strongly and regularly closed. A firm, compressed mouth gives a favourable and no deceptive idea of the muscular power of the animal. Lips apart from each other, and hanging down, indicate weakness or old age, or dulness and sluggishness.

The depth of the mouth, or the distance from the fore part to the angle of the lips, should be considerable, first, for the sake of beauty. A short protuberant mouth would be a bad finish to the tapering face of the blood horse;—more room is likewise given for the opening of the nostril, which we have seen to be an important consideration. The bridle will not be carried well, and the horse will hang heavy on hand, if there be not considerable depth of mouth.

The angles of the lips are frequently made sore or wounded by the smallness or shortness of the snaffle, and by the unnecessary and cruel tightness of the bearing rein. This rein not only gives the horse a grander appearance in harness, and places the head in that position in which the bit most powerfully presses upon the jaw, but there is no possibility of driving without it, unless the arm of the driver were as strong as that of Hercules; and most certainly there is no safety if it be not used. There are few horses who will not bear, or *bore* upon something, and it is better to let them bore upon themselves than upon the arm of the driver. Without this control, many of them would hang their heads low and be disposed every moment to stumble, and would defy all pulling, if they tried to run away. There is, and can be no necessity, however, for using a bearing-rein so tight as to cramp the muscles of the head, and which is indicated by the animal's continually tossing up his head:—they may indeed be cramped to such a degree, that the horse is scarcely able to bring his head to the ground, when turned to grass. The tight rein injures and excoriates the angles of the lips, and frequently brings on poll-evil. We saw a poor horse at work, unroughed, during a severe frost. He was continually sliding about, and in danger of falling. The stupid driver buckled the bearing-rein as tight as he could, *to keep him up;* and the consequence was, that by the sudden and forcible pressing upon the iron, in the slips which would still every moment occur, the corners of the mouth were absolutely cut through to a considerable depth. Except it be a restive or determined horse, there should be little more bearing on the mouth than is generally used in riding. This the horse likes to feel, and it is necessary for him in the swift gallop. We must have the bearing-rein, whatever some men of humanity may say against it; but we need not use it cruelly.

THE BONES OF THE MOUTH.

The bones in and giving form to the mouth, are the superior maxillary, or upper jaw (*b*, p. 63, and *l*, p. 66), containing the grinders, the anterior maxillary, or lower part of the upper jaw (*b*, p. 63, *n*, p. 66, *r*, p. 68), containing the upper-nippers or cutting-teeth; the palatine bone (below 8, p. 68), and the posterior maxillary or under jaw (*a*, p. 63, and *w*, p. 68), containing all the under teeth. We will speak of them very shortly, in the order in which we have mentioned them.

The superior maxillary is, with the exception of the lower jaw, the largest bone in the face. It unites above with the lachrymal bone (*i*, p. 66); and, more on the side, with the malar or cheek bone, *k*; and a portion of it, continued upward, and underneath, enters into the orbit. Above, and on the front of the face, it unites with the bones of the nose, *j*, and below, with the inferior maxillary, *n*. That which most deserves notice in it, externally, is the ridge or spine, seen at *b*, p. 63, but better delineated in the cut of the head, p. 67, continued from the base of the zygomatic arch, and across the malar bone. It and the surface beneath serve to give attachment to the masseter muscle, concerned almost as much as the temporal one, in the act of chewing. The dark spot (*m*, p. 66, and seen likewise at p. 63) marks the foramen or hole, through which a branch of the fifth pair of nerves proceeds to give sensibility to the lower part of the face. As it approaches the teeth, this bone separates into two plates, and these are divided by long partitions, which contain and firmly hold the upper grinders. The lower plate then projects inwards, and forms (*t*, p. 68) the principal portion of the roof of the mouth, and the floor of the cavity of the nose. The corresponding bone on the other side meets its fellow in the centre of the palate. The upper jaw-bone contains in it large cavities, beside the cavities for the teeth, and these open into and enlarge the cavity of the nose. They are connected with the voice, but not with the smell, for the expansion of the olfactory or smelling nerve has never been traced beyond the bones and membranes of the proper cavity of the nose. The maxillary sinuses are generally filled with matter in bad cases of glanders.

Below these are the anterior maxillary bones (*f*, p. 63, *a*. p. 68), containing the upper cutting teeth, with the tushes belonging both to the upper and anterior bones. These are the bones to which (see cut, p. 68) the upper lip is attached. The superior and anterior maxillary bones are separated in animals with long faces, like the horse, that by overlapping each other strength might be gained.

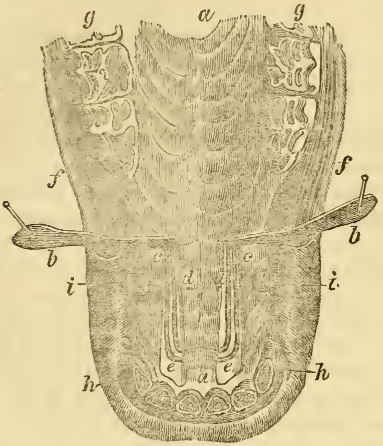
The palatine bone forms but a very small portion of the palate. It surrounds the edge of the communication between the cavity of the nose and the back parts of the mouth.

THE PALATE.

Adhering to a portion of all three of the bones just described, and being the lining of the roof of the mouth, is the hard palate, (*t*, p. 68,) composed of a firm dense substance divided into several ridges called *bars*. The cut gives a view of them.

The cut will point out the bleeding place, if the horse should be attacked with the megrims on a journey, and the rider or driver should not have a lancet. Precisely in a line between the middle and second cutting teeth, and a little more than an inch within the mouth, the artery and vein make a curve. They may there be cut down upon with a sharp knife, and a plentiful stream of blood will be obtained, which will usually stop of itself when two or three quarts of blood have been obtained. The artery being cut across will shrink, and soon cease to bleed, and the application of a sponge filled with cold water will generally stop the bleeding of the vein. No injury will result from the division of the nerve, for it is a mere nerve of feeling, distributed over those parts.

CUT OF THE PALATE.



a	The palate divided into ridges or bars.
b	A strip dissected up to show the vessels and nerve beneath.
c	The palatine artery.
d	The palatine vein.
e	The palatine nerve between the artery and the vein.
f	The cheek divided, showing the direction of the muscular fibres.
g	The grinders.
h	The nippers.
i	The tushes.

Should the cut be made a little too much on one side, and about the middle of the second incisor tooth, the artery may be wounded longitudinally, but not divided, and there may be very great difficulty in stopping the blood. We recollect a horse which almost bled to death from the artery being thus wounded. If, however, a large and firm pledget of lint or tow be rolled round a piece of twine, and that tied firmly round the front teeth, the pressure on the part will effect the desired purpose; or should this in a very few cases fail, a gag may be easily contrived to press upon the pledget, and the bleeding will immediately cease.

We are speaking of this as a make-shift sort of bleeding when the horse is on a journey; but we should decidedly object to the cutting of the bars as the usual mode of taking blood. The blood cannot be measured; the degree of inflammation cannot be ascertained by the manner in which it coagulates, and there may be difficulty to the operator, and annoyance and pain to the horse in stopping the bleeding.

LAMPAS.

Some of the lower bars occasionally swell, and rise to a level with, and even beyond the edge of the teeth, and they are very sore, and the horse feeds badly on account of the pain he suffers from the pressure of the food on the bars. This is called the Lampas; and it may arise from inflammation of the gums, propagated to the bars, when the horse is shedding his teeth; (and young horses are more subject to it than others;) or from some slight febrile tendency in the constitution generally, as when a young horse has lately been taken up from grass, and has been over-fed, or not sufficiently exercised.

In the majority of cases the swelling will soon subside without medical treatment; or a few mashes, and gentle alteratives, will relieve the animal. A few slight cuts across the bars with a lancet or penknife, and taking care to avoid the principal artery and vein of the palate, the situation of which has been just pointed out, will relieve the inflammation, and cause the swelling to subside; indeed, this scarification of the bars will seldom do harm, although it is far from being so necessary as is supposed. To the brutal custom of the farrier, who sears and burns down the bars with a red hot iron, we do most peremptorily object. It is torturing the horse to no purpose; and it is rendering that part callous, on the delicate sensibility of which all the pleasure and safety of riding and driving depend. It may be prudent in case of lampas to examine the grinders, and more particularly the tushes, to see whether either of them is endeavouring to make its way through the gum. If with the gum lancet, or penknife, two incisions across each other be made on the tooth, the horse will experience immediate relief.

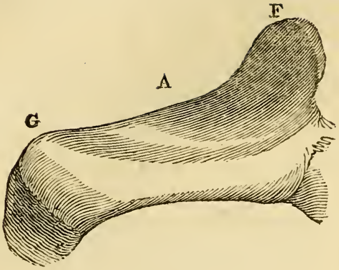
THE LOWER JAW.

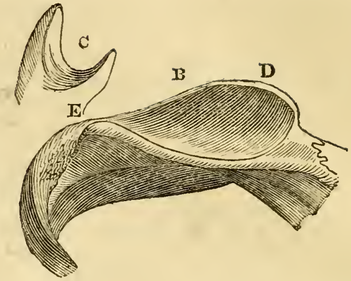
The posterior or lower jaw may be considered as forming the floor of the mouth, (*a*, p. 63, or *w*, p. 68.) The body or lower part of it contains the under cutting teeth, and the tushes; the sides are two flat pieces of bone, containing the grinders. On the inside, and opposite to *a*, p. 63, is a hole through which blood-vessels and nerves enter to supply the teeth, and some of which escape again at another hole on the outside, and near the nippers. The branches are broader and thinner, rounded at the angle of the jaw, and terminating in two processes. One, the *coracoid*, from its sharpness or supposed resemblance to a beak, passes under the zygomatic arch, (see p. 63,) and the temporal muscle, arising from the whole surface of the parietal bone (see p. 70), is inserted into it, and wrapped round it; and by its action, principally, the jaw is moved, and the food is ground. The other, the *condyloid*, or rounded process, is received into the glenoid (shallow) cavity of the temporal bone, at the base of the zygomatic arch, and forms the joint on which the lower jaw moves. This joint is easily seen in the cut at page 63; and being placed so near to the insertion of the muscle, or the centre of motion, the temporal muscle must act with very considerable mechanical disadvantage, and must possess immense power.

This joint is admirably contrived for the purpose which the animal requires. It will admit freely and perfectly of the simple motion of a hinge, and that is the motion of the jaw in nipping the herbage and seizing the corn. But the grass, and more particularly the corn, must be crushed and bruised before it is fit for digestion. Simple champing, which is the motion of the human lower jaw, and that of most beasts of prey, would very imperfectly break down the corn. It must be put into a *mill;* it must be actually *ground.*

It *is* put into a mill, and as perfect a mill as imagination can conceive.

The following cuts represent the glenoid cavity in a carnivorous, or flesh-eating, and herbivorous, or grass-eating animal, *viz.* the tiger and the horse: the one requiring a simple hinge-like motion of the lower jaw to tear and crush the food; the other a lateral or grinding motion to bring it into a pulpy form. First examine this cavity in the tiger, represented at B. At the root of the zygomatic process D, is a hollow with a ridge along the greater part of the upper and inner side of it, standing to a considerable height, and curling over the cavity. At the





lower and opposite edge of the cavity, but in the outside, is a similar ridge, E, likewise rising abruptly and curling over. At C is another and more perfect view of this cavity in a different direction. The head of the lower jaw is received into this hollow, and presses against these ridges, and is partially surrounded by them, and forms with them a very strong joint, where dislocation is scarcely possible, and admitting the hinge-like or cranching motion to its fullest extent; permitting the animal violently to seize his prey, to hold it firmly, and to crush it to pieces; but, from the extent and curling form of the ridges, forbidding, except to a very slight degree, all lateral, and grinding motion, and this because the animal does not want it.

The food of the horse must be *ground*—simple bruising and champing would not reduce it sufficiently small for the purposes of digestion. Then observe the different construction to effect this. A gives the glenoid cavity of the horse. First, there is the upper ridge assuming a rounded form, F, and therefore called the *mastoid process;* and—a peculiarity in the horse—the mastoid process of the *squamous* portion of the temporal bone: sufficiently strong to support the pressure and action of the lower jaw when cropping the food or seizing an enemy, but not encircling the head of that bone, and reaching only a little way along the side of the cavity, where it terminates, having its edges rounded off, so as to admit, and to be evidently destined for a circular motion about it. Then, at the other and lower edge of the cavity, and on the outside, G, is placed, not a curling ridge as in the tiger, but a mere tubercle: and for what reason? evidently to limit this lateral or circular motion—to permit it as far as the necessities of the animal require it, and then to arrest it—but how? not suddenly or abruptly; but this tubercle, of which we have already spoken as strengthening this portion of the zygomatic arch, yet, now discharging another office, has a smooth and gradual ascent to it, up which the lower jaw may climb to a certain extent, and then, by degrees, be stopped. We speak not now of the moveable cartilage which is placed in this cavity, and between the bones, to render the motion easier and freer. It is found in this joint in every quadruped; and it is found wherever motions are rapid and of long continuance.

So great is the conformity between the structure of the animal and his destination, that a tolerable student in natural history, by the mere inspection of the glenoid cavity, will at once determine whether the animal to which it belonged was carnivorous, and wanted no lateral motion of the jaw; or omnivorous, living occasionally on all kinds of food, and requiring some degree of grinding motion; or herbivorous, and needing the constant use of this admirably constructed mill.

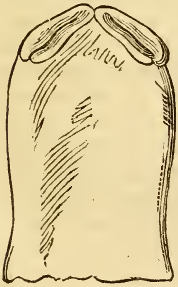
At *g*, page 119, is represented the *masseter* muscle, an exceedingly strong one, constituting the cheek of the horse arising from the superior maxillary under the ridge continued from the zygomatic arch, and inserted into the lower jaw, and particularly round the rough border at the angle of the jaw. This acts with the temporal muscle in closing the jaw, and in giving the direct cutting or champing motion of it.

Inside the lower jaw, on each side, and occupying the whole of the hollowed portion of them, and opposite to the masseters, are the pterygoid muscles, going from the jaws to bones more in the centre of the channel, likewise shutting the mouth, and also, by their alternate action, giving that grinding motion which we have described.

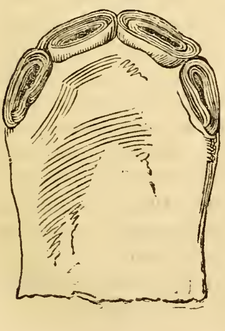
The space between the branches of the lower jaw, called the *channel*, is of considerable consequence. It may be a little too wide, and then the face may have a clumsy appearance; but if it be too narrow, the horse will never be able to bend his head freely and gracefully; he will be always pulling and boring upon the hand, nor can he possibly be well reined in.

The jaws contain the teeth, which are the millstones employed in this operation. The mouth of the horse at five years old contains forty teeth, viz. six nippers or cutting teeth in front, a tush on each side, and six molars, or grinding teeth, above and below; they are contained in cavities in the upper and lower jaws, surrounded by bony partitions, to which they are accurately fitted, and by which they are firmly supported. For a little way above these bony cavities, they are surrounded by a hard substance called the gum, so dense, indeed, and adhering so closely to the teeth and the jaws, as not to be separated without very great difficulty; singularly compact, that it may not be wounded by the hard or sharp particles of the food, and almost devoid of feeling, for the same purpose.

Seven or eight months before the foal is born, the germs or beginnings of the teeth are visible in the cavities of the jaws. The tooth grows, and presses to the surface of the gum, and forces its way through it; and at the time of birth the first and second grinders have appeared, large compared with the size of the jaw, and seemingly filling it. In the course of seven or eight days the two centre nippers are seen as here represented.



They likewise appear to be large, and to fill the front of the mouth, although they will afterwards be found to be small, compared with the permanent teeth that follow. In the course of the first month the third grinder appears above and below, and not long after, and generally before six weeks have expired, another incisor above and below will be seen on each side of the two first, which have now considerably grown, but not attained their perfect height. This cut will then represent the appearance of the mouth.



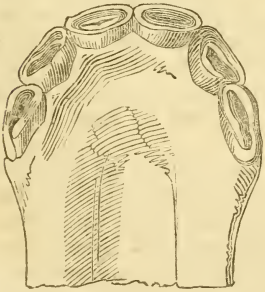
At two months, the centre nippers will have reached their natural level, and between the second and third month the second pair will have overtaken them. They will then begin to wear a little, and the outer edge, which was at first somewhat raised and sharp, is brought to a level with the inner edge, and so the mouth continues until some time between the sixth and ninth month, when another nipper begins to appear on each side of the two first, making six above and below, and completing the *colt's* *mouth;* after which, the only observable difference, until between the second and third year, is in the wear of these teeth.

The term *nipper* is familiar to the horseman and the farrier, and much better expresses the action of these teeth than the word *incisor* or *cutter*, which is adopted by anatomists. Whoever has observed a horse in the act of browsing, and the twitch of the head which accompanies the separation of each portion of grass, will perceive that it is nipped or torn rather than cut off.

These teeth are covered with a polished and exceedingly hard substance, called the enamel; indeed, it is so hard that it almost bids defiance to the action of a file. It spreads over that portion of the teeth which appears above the gum, and not only so, but as they are to be so much employed in nipping the grass, and gathering up the animal's food, and in such employment even this hard substance must be gradually worn away, a portion of it, as it passes over the upper surface of the teeth, is bent inward, and sunk into the body of the teeth, and forms a little pit in them; and the inside and bottom of this being blackened by the food, constitutes the *mark* of the teeth, by the gradual disappearance of which, in consequence of the wearing down of the teeth, we are enabled for several years to judge of the age of the animal.

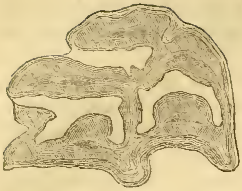
Dealers often talk of the filling up of the tooth. This is altogether a vulgar error. The mark never fills up. The peculiar cementing substance, which occupies the funnel or pit made by the dipping in of the enamel, never grows up, but the ridge of enamel around it is worn down, and then the blackness at the bottom is rubbed off.

The colt's nipping teeth are rounded in front, somewhat hollow towards the mouth, and present at first a cutting surface, with the outer edge rising in a slanting direction above the inner edge. This, however, soon begins to wear down until both surfaces are level, and the *mark*, which was originally long and narrow, becomes shorter, and wider, and fainter. At six months the four nippers are beginning to wear to a level. The annexed cut will convey some idea of the appearance of the teeth at twelve months. The four middle teeth are evidently level—the corner ones becoming so. The mark in the two middle teeth is wide and faint; in the two next teeth it is darker, and longer, and narrower; and in the corner teeth it is darkest, and longest, and narrowest.



We may now speak of the back teeth, or grinders. They will not guide us far in ascertaining the age of the animal, for we cannot easily inspect them; but there are some interesting particulars connected with them. The foal is born with two grinders in each jaw, above and below, or they appear within three or four days after the birth; and before the expiration of a month they are succeeded by a third, more behind. The grinders are, like the cutting teeth, covered with enamel on the sides, but not on the top, though several portions of enamel enter into their substance. They have a great deal more to do than the nippers, and are employed in grinding down the hardest portion of the food; nature has, therefore, made an additional provision for their strength and endurance.

This cut represents a grinder sawn across. It seems to be a most irre-



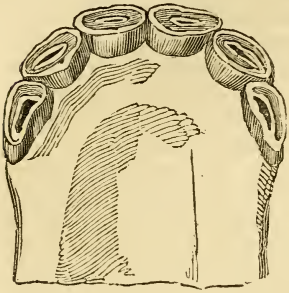
gular and intricate machine; but the explanation of it is not difficult. The tooth is formed and prepared in cavities within the jaw-bones. A delicate membranous bag, containing a jelly-like substance, is found, in the unborn animal, in a little cell within the jaw-bone. It assumes, by degrees, the form of the tooth that is to appear, and then the jelly within the membrane begins to change to bony matter; and a hard and beautiful crystallization is formed on the membrane without, and so we have the cutting tooth covered by its enamel. In the formation, however, of each of the grinders of the horse, there are originally five of these membranous bags in the upper jaw, and four in the lower, filled with jelly. This jelly by degrees, gives place to bony matter, which is thrown out by little vessels penetrating into it, and is represented by the darker portions of the cut with central black spots. The crystallization of enamel can be traced around each, and so there would be five distinct bones or teeth. A third substance, however, is now secreted, (which is represented by the white spaces,) and is a powerful cement, uniting all these distinct bones into one body, and making one tooth of the five: this being done, another coat of enamel spreads over the sides, but not the top, and the tooth is completed. By no other contrivance could we have the *grinding* tooth capable, without injury and without wearing, to rub down the hay, and oats, and beans, which constitute the stable food of horses. The teeth of the animal who lives on flesh, and the upper part of whose teeth alone are covered with this enamel, and even the nipping teeth of the horse, with the simple well of enamel running a certain way down their centre, would soon be rubbed down and destroyed. It is necessary to have columns of enamel penetrating through the whole substance of the tooth. There is another advantage;—the bony matter, and the cement by which the different sheils are united, and which occupy the spaces between the columns of enamel, soon begin to wear away, while the enamel remains; and thence results the irregular surface of the grinding teeth, being that kind of surface which it is necessary for them to possess, in order to effect the purpose for which they were intended.

The grinders in the lower jaw, having originally but four of these bags or shells, are smaller, and narrower, and more regular, than the upper ones. They are not placed horizontally in either jaw; but in the lower, the higher side is within, and shelving gradually outward; in the upper jaw the higher side is without, shelving inward, and thus the grinding motion is most advantageously performed. There is also an evident difference in the appearance and structure of each of the grinders, so that a careful observer could tell to which jaw every one belonged, and what situation it occupied—but we should depart from the object of our work if we entered into these minutiæ.

At the completion of the first year, a fourth grinder usually comes up, and the yearling has then, or soon afterwards, six nippers, and four grinders above and below in each jaw, which, with the alteration in the appearance of the nippers we have just described, will enable us to calculate pretty nearly the age of the foal, subject to some variations arising from the period of weaning, and the nature of the food.

At the age of one year and a half, the mark in the central nippers will be much shorter and fainter; that in the two other pairs will have undergone an evident change, and all the nippers will be flat.

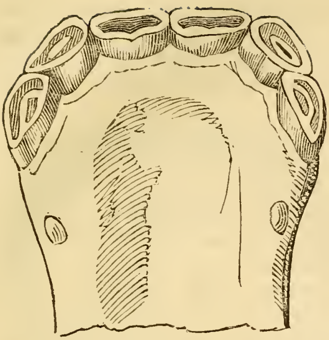
At two years all this will be more manifest. The accompanying cut deserves attention, as giving an accurate representation of the nippers in the lower jaw of a two year-old colt.



About this period a fifth grinder will push out, and now, likewise, will commence another process. The first teeth are adapted to the size and wants of the young animal. They are sufficiently large to occupy and to fill the colt's jaws; but when the jaws are expanded with the increasing growth of the animal, the teeth are separated too far from each other to be useful, and another and larger set is required. Evident provision is made for these, even before the colt is foaled. In cavities in the jaw, beneath the first and temporary teeth, are to be seen the rudiments of a second and permanent set. These gradually increase, and some with greater rapidity than others, and pressing upon the roots or fangs of the first teeth, the consequence of this pressure is, not that the first teeth are forced out, but the portion pressed upon gradually disappears; it is *absorbed*—taken up, and carried away, by numerous little vessels, whose office it is to get rid of the worn out or useless part of the system. This absorption continues to proceed as the second teeth grow and press upon their predecessors, until the whole of the fang is gone, and the crown of the tooth, or that part of it which was above the gum, having no longer firm hold, drops out, and the second teeth appear, larger and stronger, and permanent. In a few instances, however, the second teeth do not rise immediately under the temporary or milk teeth, but somewhat by their side; and then, instead of this gradual process of absorption and disappearance from the point of the root upwards, the root being compressed sideways, diminishes throughout its whole bulk; the crown of the tooth diminishes with the root; and the whole is pushed out of its place, to the forepart of the first grinder, and remains for a considerable time, under the name of a *wolf's tooth*, causing swelling and soreness of the gums, and frequently wounding the cheeks. These would be gradually quite absorbed, but the process might be slow and the annoyance would be great; and therefore it is proper to get rid of these diminutive teeth, either by punching them out, or drawing them as soon as they are perceived.

This change of teeth commences in those which earliest appeared, and, therefore, the front or first grinder gives way at the age of two years, and is succeeded by a larger and permanent tooth. Now, likewise, seriously commences, in too many cases, the roguery of horse-dealers and breeders. A colt rapidly increases in value, as his age and growth increase. A three-year-old colt is worth twenty-five per cent. more than a two-year-old one; and if a dealer has a strong and likely colt, that was dropped early in the year, and whose form and points might deceive the unwary, he is anxious to pass him if he can for a three-year-old. To accomplish this, he must give him a three-year-old mouth; and between two years and a half and three years, the two middle nippers are displaced, and succeeded by two permanent teeth.

During the period between the falling out of the central milk nippers, and the coming up of the permanent ones, the colt, having a broken mouth, may have some difficulty in grazing. If he should fall away considerably in condition, he should be fed with mashes and corn, or cut meat.



This cut will represent a three year-old mouth. The central teeth are larger than the others, with two grooves in the outer convex surface, and the mark is long, narrow, deep and black; and not having yet attained their full growth, they are not so high as the others. The mark in the two next nippers is nearly worn out, and it is wearing away in the corner nippers. Is it possible to give this mouth to an early two-year-old? The ages of all horses are reckoned from May, but some are foaled even so early as January, and being actually four months over the two years, if they have been well nursed and fed, and are strong and large, they may, with the inexperienced, have an additional year put upon them. The central nippers are punched or drawn out, and the others appear three or four months earlier than they otherwise would. In the natural process, they could only rise by long pressing upon, and causing the absorption of the first set. The first set mechanically oppose their rising, and that opposition being removed, it is reasonable to imagine that their progress will be more rapid. Three or four months will be gained, and these three or four months may enable the breeder to term him a late colt of a preceding year. To him, however, who is accustomed to horses, (although it is long practice alone which could give this facility of judgment,) the general form of the animal, the little development of the forehand, the continuance of the mark on the next pair of nippers, its more evident existence in the corner ones, some enlargement or irregularity about the gums from the violence used in forcing out the teeth, the small growth of the first and fifth grinders, and the non-appearance of the sixth grinder, which if it is not through the gum at three years old, is swelling under it, and preparing to get through, any or all of these circumstances, carefully attended to, will be a sufficient security against deception.

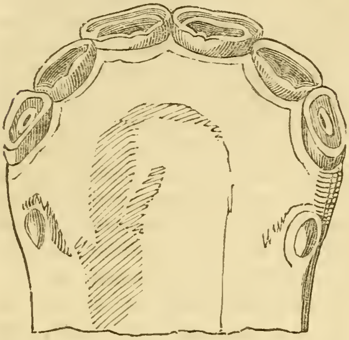
It is so unusual to look at the teeth in the upper jaw of a young horse, that the dealer who wishes to give a false appearance of age, frequently confines his operation to the lower jaw, and, in consequence of this, when the teeth of the lower jaw are thus made to push out, they are still below the gum in the upper jaw, although, in the natural process, they are cut a little sooner in the upper than in the lower jaw. It may, therefore, be good policy always to examine both jaws.

A horse then at three years old ought to have the central permanent nippers growing—the other two pairs wasting—six grinders in each jaw, above and below—the first and fifth molars level with the others, and the sixth protruding. The sharp edge of the new incisors, although it could not be well expressed in our cut, will be very evident when compared with the neighbouring teeth.

As the permanent nippers grow, and press upon the teeth at their side, those teeth will begin gradually to diminish. Not only will the mark be wearing out, but the crowns of the teeth will be considerably smaller.

At three years and a half, or between that and four, the next pair of nippers will be changed, and the mouth at that time cannot be mistaken. The central nippers will have attained nearly their full growth; a vacuity will be left where the second stood, or they will begin to peep above the gum,—and the corner ones will be diminished in breadth—worn down—

and the mark becoming small and faint. At this period, likewise, the second pair of grinders will be shed, and, previous to this, will be the attempt of the dealer to give to his three-year-old an additional year, but the fraud may be detected by an examination similar to that which we have already described.



At four years, the central nippers will be fully developed; the sharp edge somewhat worn off; the mark shorter, wider and fainter: the next pair will be up, but they will be small, with the mark deep, and extending quite across them; and the corner nippers, larger than the inside ones, yet smaller than they were, flat, and the mark nearly effaced; the sixth grinder will have risen to a level with the others, and the tushes will begin to appear.

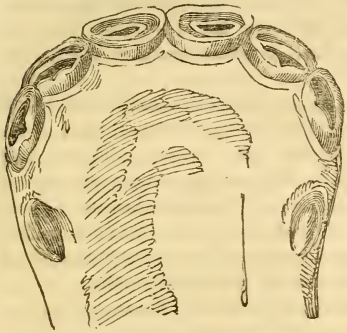
Now, more than at any other time, will the dealer be anxious to put an additional year upon the animal, for the difference between a four-year-old colt, and a five-year-old horse, in strength, utility, and value, is very great; but the want of wear in the other nippers—the small size of the corner ones—the little growth of the tush—the smallness of the second grinder—the low fore-hand—the legginess of the colt, and the thickness and little depth of the mouth, will, to the man of common experience among horses, at once detect the cheat.

The tushes (see p. 134) are four in number, two in each jaw, situated between the nippers and the grinders, much nearer to the former than the latter, and nearer in the lower jaw than in the upper, but this distance increasing in both jaws with the age of the animal. In shape it somewhat resembles a cone; it protrudes about an inch from the gum, and has its extremity sharp-pointed and curved. At the age of which we are now speaking, the tushes are almost peculiar to the horse, and castration does not appear to prevent or retard their development. All mares, however, have the beginnings of them in the chambers of the jaw, and they appear externally in the majority of old mares. Their use is not evident:—perhaps in the wild state of the animal they are weapons of offence; so as that he can more firmly seize, and more deeply wound his enemy.

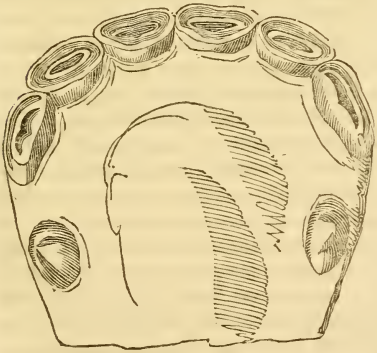
The breeder often attempts to hasten the appearance of the tush, and he cuts deeply through the gum to remove the opposition which that would afford. To a little extent he succeeds. He may possibly gain a few weeks, but he cannot gain more; for the resistance of the gum is not like that of a solid and firmly fixed tooth, and is much more easily overcome by the regular process of nature. After all, there is much uncertainty as to the appearance of the tush, and it may vary from the fourth year to four years and six months. It belongs, in the upper jaw, both to the inferior and superior maxillary bones (see *n*, p. 66); for, while its fang is deeply imbedded in the inferior maxillary, the tooth penetrates the process of the superior maxillary at the union of those bones.

At four years and a half, or between that and five, the last important change takes place in the mouth of the horse. The corner nippers are shed, and the permanent ones begin to appear; the central nippers are considerably worn, and the next pair are beginning to show marks of usage. The tush has now protruded, and is generally a full half inch in height;

externally it has a rounded prominence, with a groove on either side, and within it is evidently hollowed. Our readers need not be told that from the rising of the corner nipper the animal changes its name—the colt becomes a horse, and the filly a mare.



At five years the horse's mouth is almost perfect. The corner nippers are quite up, with the long deep mark irregular on the inside; and the other nippers bearing evident tokens of increasing wearing. The tush is much grown;—the grooves have almost, or quite disappeared; and the outer surface is regularly convex:—it is still as concave within, and with the edge nearly as sharp as it was six months before; the sixth molar is quite up, and the third molar is wanting. This last circumstance, if the general appearance of the animal, and particularly before, and the wearing of the centre nippers, and the growth and shape of the tushes, be likewise carefully attended to, will prevent deception, if a late four-year-old be attempted to be substituted for a five. The nippers may be brought up a few months before their time, and the tushes a few weeks, but the grinder is with difficulty displaced. The three last grinders and the tushes are never shed.

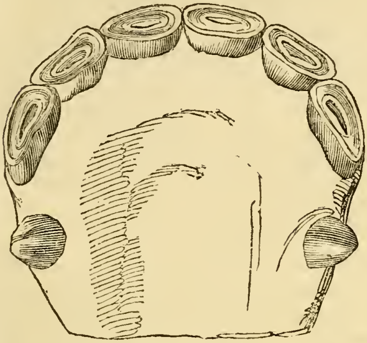


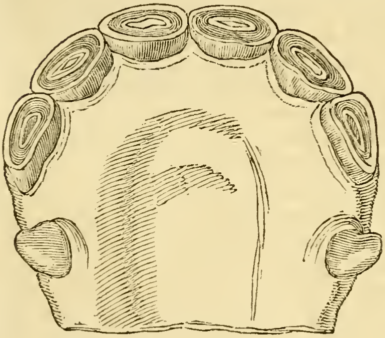
At six years the *mark* on the centre nippers is worn out. There will still be a difference of colour in the centre of the tooth. The cement filling the hole made by the dipping in of the enamel will present a browner hue than the other part of the tooth, and it will be evidently surrounded by an edge of enamel, and there will even remain a little depression in the centre, and also a depression round this case of enamel; but the deep hole in the centre of the teeth, with the blackened surface which it presents, and the elevated edge of enamel, will have disappeared. Persons not much accustomed to horses have been sadly puzzled here. They expected to find a plain surface of an uniform colour, and knew not what conclusion to draw when there was both discolouration and irregularity.

In the next incisors the mark is shorter, broader, and fainter; and in the corner teeth the edges of the enamel are more regular, and the surface is evidently worn. The tush has attained its full growth, being nearly or quite an inch in length, convex outward, concave within, tending to a point, and the extremity somewhat curved. The third grinder is fairly up, and all the grinders are level.

Now, or perhaps at a period of six months before, the horse may be said to have a perfect mouth. All the teeth are produced, fully grown, and have hitherto sustained no material injury. During these important changes of the teeth the animal has suffered less than could be supposed possible. With children, the period of teething is fraught with danger.

Dogs are subject to convulsions, and hundreds of them die, from the irritation caused by the cutting or shedding of their teeth; but the horse appears to feel little inconvenience. The gums and palate are occasionally somewhat hot and swollen, but the slightest scarification will remove this. The teeth of the horse are more necessary to him than those of the other animals are to them. The child may be fed, and the dog will bolt his victuals, but the food of the horse must be well ground down, or the nutriment cannot be extracted from it.





At seven years, the mark, in the way in which we have described it, is worn out in the four central nippers, and fast wearing away in the corner teeth; and the tush is beginning to be altered. It is rounded at the point; rounded at the edges; still round without; and beginning to get round inside.

At eight years old, the mark is gone from all the bottom nippers; the tush is rounder in every way; and the mark is now said to be out of the mouth. There is nothing remaining in the bottom nippers which can afterwards clearly shew the age of the horse, or justify the most experienced examiner in giving a positive opinion.

Dishonest dealers have been said to resort to a method of prolonging the mark in the lower nippers. It is called *bishoping*, from the name of the scoundrel who invented it. The horse of eight or nine years old is thrown, and with an engraver's tool a hole is dug in the now almost plain surface of the corner teeth, and in shape and depth resembling the mark in a seven-year-old horse. The whole is then burned with a heated iron, and a permanent black stain is left: the next pair of nippers are sometimes lightly touched. An ignorant man would very easily be imposed on by this trick; but the irregular appearance of the cavity, the diffusion of the black stain around the tushes, the sharpened edges and concave inner surface of which can never be given again, and the marks on the upper nippers, together with the general conformation of the horse, can never deceive the careful examiner.

Horsemen, after the horse is eight years old, are accustomed to look to the nippers in the upper jaw, and some conclusion has been drawn from the appearances which they present. It cannot be doubted that the mark remains in them some years after it is obliterated from the nippers in the lower jaw; because the hard substance, or kind of cement, by which the pit or funnel in the centre of the tooth is occupied, does not reach so high, and there is consequently a greater depth of tooth to be worn away in order to reach it; and because the upper nippers are not so much exposed to friction and wear as the under. The lower jaw alone is moved, and pressed forcibly upon the food: the upper jaw is without motion, and has only to resist that pressure.

There are various opinions as to the intervals between the disappearance of the marks from the different cutting teeth. Some have averaged it at two years, and others at one. We are inclined to adopt the latter opinion, and then the age would be thus determined: at nine years the mark will be worn from the middle nippers—from the next pair at ten, and from all the upper nippers at eleven. During these periods the tush is likewise undergoing a manifest change: it is blunter, shorter, and rounder. In what degree this takes place in the different periods, long and most favourable opportunities for observation can alone enable the horseman to decide, or rather we believe that the tush alone will not enable us to form a very accurate judgment.

The tushes are exposed to but little tear and wear. The friction against them must be slight, proceeding only from the passage of the food by them, and from the motion of the tongue, or from the bit; and their alteration of form, although generally as we have described them, is frequently uncertain. The tush will sometimes be blunt at eight, and remain pointed at eighteen; and occasionally, according to the direction which they take, or degree in which they rub against each other, the tushes on the different sides will present an apparent variation of one or two years. The upper tush, although the latest in appearing, is soonest worn away.

Are there any circumstances to guide our judgment after this? There are those which will prepare us to guess at the age of the horse, or to approach within a few years of it, until he becomes very old: but there are none which will enable us accurately to determine; and the indications of age must now be taken from the shape of the upper surface of the nippers. At eight, they are all oval, the length of the oval running across from tooth to tooth: but as the horse gets older, the teeth diminish in size, and they at first diminish in width, and not in thickness. They become a little apart from each other, and their surfaces are rounded. At nine, the centre nippers are evidently so,—at ten, the others begin to have the oval shortened. At eleven, the second pair of nippers are quite rounded, and at thirteen, the corner ones have that appearance. At fourteen, the faces of the central nippers become somewhat triangular. At seventeen, they are all so. At nineteen, the angles begin to wear off, and the central teeth are again oval, but in a reversed direction, *viz.* from outward, inward; and at twenty-one, they all wear this form. This is the opinion of some continental veterinary surgeons, and Mr. Percival first presented them to us in an English dress. We believe the statement is correct to a very considerable extent, but we leave our readers to form their own judgment.

It would be folly indeed to expect accuracy at this advanced age of the horse, when we are bound to confess, that the rules we have laid down for determining this matter at an earlier period, although they are recognised by horsemen generally, and referred to in courts of justice, will not guide us in every case. Stabled horses have the mark sooner worn out than those that are at grass, and a crib-biter may deceive the best judge by one or two years. The age of the horse, likewise, being uniformly calculated from the 1st of May, it is sometimes exceedingly difficult, or almost impossible, about that time, to determine whether the animal be a late foal of one year, or an early one of the next. At nine or ten, the bars of the mouth become less prominent, and their regular diminution will designate increasing age. At eleven or twelve, the lower nippers change their original upright direction, and project forward or horizontally; and they become yellow and covered with tartar. They are yellow, because the teeth must grow to answer to the wear and tear of them; but the enamel which covered their surface when they were first produced cannot be repaired, and that which wears this yellow colour in old age is the part which, in youth, was in the socket, and therefore destitute of enamel.

The upper nippers become arched, and project over the lower ones, wearing down the outer edge, and gradually making that the lowest, which was at first considerably the highest.

The general indications of old age, independent of the teeth, are deepening of the hollows over the eyes,—grey hairs, and particularly over the eyes, and about the muzzle; thinness and hanging down of the lips; sharpness of the withers; sinking of the back; lengthening of the quarters; and the disappearance of windgalls, spavins, and tumours of every kind.

Of the natural age of the horse we should form a very erroneous estimate, from the early period at which he is now worn out and destroyed. Mr. Blaine tells us of a gentleman, who had three horses, which died at the ages of thirty-five, thirty-seven and thirty-nine. Mr. Cully mentions one that received a ball in his neck, at the battle of Preston, in 1715, and which was extracted at his death, in 1758; and Mr. Percival gives an account of a barge horse that died in his sixty-second year.

There cannot be a severer satire on the English nation, than that, from the absurd practice of running our race-horses at two and three years old, and working others in various ways, long before their limbs are knit, or their strength come, and cruelly exacting from them services far beyond their powers, their age does not average a sixth part of that of the last-mentioned horse. The scientific author of the "Animal Kingdom" declares, that "it may be safely asserted, that more horses are consumed in England, in every ten years, than in any other country in the world, in ten times that period, except those which perish in war."

This point has with the English been too long considered as one of mere profit and loss; and it has been thought to be cheaper to bring the young horse early into work, and in a short time to exhaust his whole strength, than to maintain him for a long period, and at a considerable expense, almost useless. The matter requires much consideration, and we think much reformation too.

DISEASES OF THE TEETH.

Of the diseases of the teeth in the horse, we know little. Carious or hollow teeth have occasionally, but not often, been seen; but the edges of the grinders from the wearing off of the enamel, or the irregular growth of the teeth, become rough, and wound the inside of the cheek; it is then necessary to adopt a summary but effectual method of cure, namely, to rasp them smooth. Many bad ulcers have been produced in the mouth, by the neglect of this.

The teeth sometimes grow irregularly in length, and this is particularly the case with the grinders, from not being in exact opposition to each other, when the mouth is shut. The growth of the teeth still going on, and there being no mechanical opposition to it, one of the back teeth, or a portion of one of them, shoots up half an inch or more above the others. Sometimes it penetrates the bars above, and causes soreness and ulceration; at other times, it interferes partially, or altogether, with the grinding motion of the jaws, and the animal pines away without the cause being suspected. Here the saw should be used, and the projecting portion reduced to a level with the other teeth. The horse which has once been subjected to this operation should afterwards be frequently examined, and especially if he lose condition; and, indeed, every horse that gets thin or out of condition, without fever, or any other apparent cause, should have his teeth and mouth carefully examined, and especially if he quids (partly chewing and then dropping) his food, without any indication of sore throat, or if he holds his head somewhat on one side, while he eats, in order to get the food between the outer edges of the teeth. A horse that has once had very irregular teeth is materially lessened in value, for, although they may be sawn down as carefully as possible, they will project again at no great distance of time.

THE TONGUE.

The tongue is the organ of taste, and employed in disposing the food for grinding between the teeth, and afterwards collecting it together, and conveying it to the back part of the mouth, in order to be swallowed. It is also the main instrument in drinking, and the canal through which the water passes in the act of drinking. The root of it is firmly fixed at the bottom of the mouth, by a variety of muscles; the fore part is loose in the mouth. It is covered by a continuation of the membrane which lines the mouth, and which, doubling beneath, and confining the motions of the tongue, is called its *frænum* or bridle. On the back of the tongue, this membrane is thickened and roughened, and is covered with numerous conical *papillæ*, or little eminences, on which the fibres of a branch of the fifth pair of nerves expand, and on which the sense of taste depends. The various motions of the tongue are accomplished by means of the ninth pair of nerves. The substance of the tongue is composed of muscular fibres, with a great deal of fatty matter interposed between them, and which gives to this organ its peculiar softness.

DISEASES OF THE TONGUE.

The tongue is sometimes exposed to injury, from carelessness or violence in the act of drenching, or administering a ball, being pressed against, and cut by the edges of the grinders. A little diluted tincture of myrrh, or alum, dissolved in water, or even nature unassisted, will speedily heal the wound. The horse will bite his tongue,—most frequently in his sleep. If the injury be trifling, it requires little care; but in some instances, a portion of the tongue will be torn or nearly bitten off, and the assistance of a veterinary practitioner will be needed.

Bladders will sometimes appear along the under side of the tongue, which will increase to a considerable size, and the tongue itself will be much enlarged, and the animal will be unable to swallow, and a great quantity of ropy saliva will drivel from the mouth. This disease often exists without the nature of it being suspected. It resembles what is called the *blain* in the cow, which is a very serious complaint in that animal, frequently connected with much fever, and terminating in suffocation. If the mouth of the horse be opened, one large bladder, or a succession of bladders of a purple hue, will be seen to extend along the whole of the under side of the tongue. If they be lanced freely and deeply, from end to end, the swelling will very rapidly abate, and any little fever that remains may be subdued by cooling medicine. The cause of this disease is not clearly known. It usually proceeds, perhaps, from indigestion, connected with a general tendency to inflammation.

THE SALIVARY GLANDS.

In order that the food may be properly ground down to prepare it for digestion, it is necessary that it should be previously moistened. The food of the stabled horse, however, is dry, and his meal is generally concluded without any fluid being offered to him. Nature has made a provision for this. It has placed in the neighbourhood of the mouth, various glands, to secrete, and that plentifully, a limpid fluid, somewhat salt to the taste: this fluid is conveyed from the glands into the mouth, by various ducts in the act of chewing, and being mixed with the food, renders it more easily ground, more easily passed afterwards into the stomach, and better fitted for digestion.

The principal of these is the *pàrotid* gland (see cut, p. 119). It is placed in the hollow which extends from the root of the ear to the angle of the lower jaw. A portion of it, *q*, is represented as turned up, to shew the situation of the blood-vessels underneath. In almost every case of cold, connected with sore throat, the parotid gland is enlarged, and is immediately evident to the feeling and even to the eye. It is composed of a great number of small glands connected together, and a little tube proceeding from each, to carry off the secreted fluid. These tubes unite in one common duct. At the letter *u*, the parotid duct is seen to pass under the angle of the lower jaw, together with the submaxillary artery, and a branch of the jugular vein, and they come out again at *w*. At *r*, the duct is seen separated from the other vessels, climbing up the cheek, and piercing it to discharge its contents into the mouth, opposite to the second grinder. The quantity of fluid thus poured into the mouth, from each of the parotid glands, amounts to a pint and a half in an hour, during the action of chewing; and sometimes, when the duct has been accidentally opened, it has spirted out to the distance of several feet.

The parotid gland sympathizes with every inflammatory affection of the upper part of the throat, and therefore it is found swelled, hot, and tender, in almost every catarrh or cold. The cold is to be attacked by the usual means; and a stimulating application, almost amounting to a blister, well rubbed over the gland, will best subdue the inflammation of that body.

In bad strangles, and sometimes in violent cold, this gland will swell to a great size and ulcerate, or an obstruction will arise in some part of the duct, and the accumulating fluid will burst the vessel, and a fistulous ulcer will be formed, very difficult to heal. A veterinary surgeon alone will be competent to the treatment of either case; and the principle by which he will be guided, will be to heal the abscess in the gland as speedily as he can; or, if the ulcer be in the duct, either to restore the passage through the duct, or to form a new one, or to cut off the flow of the saliva by the destruction of the gland.

The second source of the saliva is from the *submaxillary* glands, or the glands under the jaw. One of them is represented at *s*, p. 119. The submaxillary glands occupy the space underneath, and between the sides of the lower jaw, and consist of numerous small glands, each with its proper duct, which unite together, and form on each side a common duct or vessel, that pierces through the muscles at the root of the tongue, and opens in little projections or heads, upon the *frænum* or bridle of the tongue, about an inch and a half from the front teeth. When the horse has catarrh or cold, these glands, like the parotid gland, enlarge. This often takes place after strangles, and several distinct kernels are to be felt under the jaw. We have already stated, that they may be distinguished from those swellings which accompany or indicate glanders, by their being larger, generally not so distinct, more in the centre of the channel or space between the jaws, and never adhering to the jaw-bones. The farriers call them VIVES, and often adopt cruel and absurd methods to disperse them, as burning them with a lighted candle, or hot iron, or even cutting them out. They will, in the majority of instances, gradually disperse, as the disease which produced them subsides; or they will yield to slightly stimulating embrocations; or, if they are obstinate in their continuance, they are of no further consequence, than as indicating that the horse has laboured under severe cold or strangles.

During catarrh or inflammation of the mouth, the little projections marking the opening of these ducts on either side of the bridle of the tongue are apt to enlarge, and the mouth under the tongue is a little red, and hot and tender. The farriers call these swellings BARBS or PAPS, and as soon as they discover them, mistaking the effect of disease for the cause of it, set to work to cut them close off. The bleeding which follows this operation somewhat abates the local inflammation, and affords temporary relief: but the wounds will not speedily heal; the saliva continues to flow from the orifice of the duct, and running into the irregularities of the wound, cause it to spread and deepen; and even when it heals, the mouth of the duct being frequently closed, and the saliva continuing to be secreted by the submaxillary gland, it accumulates in the duct, until that vessel bursts, and abscesses are formed, which eat deeply under the root of the tongue, and long torment the poor animal, and when closed, after a great deal of trouble, are very apt to break out again for months and years afterwards.

All that is necessary with regard to these paps or barbs is to abate the inflammation or cold which caused them to swell, and they will very soon and perfectly subside. He who ever talks of cutting them out is not fit to be trusted with a horse.

A third source of saliva is from glands under the tongue (the *sublingual glands*), which open by many little orifices under the tongue, resembling little folds of the skin of the mouth, hanging from the lower surface of the tongue, or found on the bottom of the mouth. These likewise sometimes enlarge, during cold or inflammation of the mouth, and then they are called *gigs*, and *bladders*, and *flaps in the mouth.* They have the appearance of small pimples, and the farrier is anxious to cut them off, or burn them down. The better way is to let them alone, for in a few days they will generally disappear. Should any ulceration follow them, a little tincture of myrrh, or a solution of alum, will readily heal them.

Beside these three principal sources of saliva, there are little glands to be found thickly studded on every part of the mouth, cheeks, and lips, which pour out a considerable quantity of fluid, to assist in moistening and preparing the food.

Connected with these glands, and particularly with the submaxillary and parotid glands, and being either an inflammation of them, or of the cellular substance around them, is

THE STRANGLES.

This is a disease principally incident to young horses—usually appearing between the fourth and fifth year, and oftener in the spring than in any other part of the year. It is preceded by cough, and can at first be scarcely distinguished from common cough, except that there is more discharge from the nostril, of a yellowish colour, mixed with matter, but generally without smell; and likewise a considerable discharge of ropy fluid from the mouth, and greater swelling than usual under the throat. This swelling increases with uncertain rapidity, accompanied by some fever, and disinclination to eat, partly arising from the fever, but more from the pain the animal feels in the act of chewing. There is considerable thirst; but after a gulp or two, the horse ceases to drink, yet is evidently desirous of more. In the attempt to swallow, and sometimes when not drinking, a convulsive cough comes on, which almost threatens to suffocate the animal, and thence probably the name of the disease. The tumour is about the centre of the channel under the jaw, it soon fills the whole of the space, and is evidently one uniform body, and may thus be distinguished from glanders, or the enlarged glands of catarrh. At length the centre of it becomes more prominent and softer, and it evidently contains a fluid. This rapidly increases, the tumour bursts, and a great quantity of pus is discharged. As soon as the tumour has broken, the cough subsides, and the horse speedily mends, although some degree of weakness may hang about him for a considerable time.

Of the cause of the disease we can say but little. Few horses, possibly none, escape its attack; but, that attack having passed over, the animal is free from it for the remainder of his life. Catarrh may precede, or may predispose to the attack, and undoubtedly the state of the atmosphere has much to do with it, for both its prevalence and its severity are connected with certain seasons of the year and changes of the weather. There is no preventive for the disease, nor do we believe that there is any thing contagious in it. There are strange stories told with regard to this; but the explanation of the matter is, that when several horses in the same farm or in the same neighbourhood have had strangles at the same time, they have been exposed to the same powerful but unknown exciting cause.

The treatment of strangles is very simple. As the essence of the disease consists in the formation and suppuration of the tumour under the jaw, the principal, or almost the sole attention of the practitioner should be directed to the hastening of these processes: therefore, as soon as the tumour of strangles evidently appears, the part should be actively blistered. Old practitioners used to recommend poultices; which, from the thickness of the horse's skin, must have very little effect, even if they could be confined on the part; and from the difficulty and almost impossibility of this, and their getting cold and hard, they must weaken the energies of nature, and delay the ripening of the tumour. Fomentations are little more effectual. A blister will not only secure the completion of the process, but hasten it by many days, and save the patient much pain and exhaustion; and it will produce another good effect—it will, previous to the opening of the tumour, abate the internal inflammation and soreness of the throat, and thus lessen the cough and wheezing.

As soon as the swelling is soft on the top, and evidently contains matter, it should be deeply and freely lanced. It is a bad, although frequent practice, to suffer the tumour to burst naturally, by which a ragged ulcer is formed, very slow to heal, and difficult of treatment. If the incision is deep and large enough, no second collection of matter will be formed: and that which is already formed may be suffered to run out slowly, all pressure with the fingers being avoided. The part should be kept clean, and a little friar's balsam daily injected into the wound.

The remainder of the treatment will depend on the symptoms. If there is much fever, and evident affection of the chest, and which should carefully be distinguished from the oppression and choaking occasioned by the pressure of the tumour, it will be proper to bleed. In the majority of cases, however, bleeding will not only be unnecessary, but injurious. It will delay the suppuration of the tumour, and increase the subsequent debility. A few cooling medicines, as nitre, emetic tartar, and perhaps digitalis, may be given, as the case requires. The appetite, or rather the ability to eat, will return with the opening of the abscess. Bran-mashes, or fresh cut grass or tares, should be liberally supplied, which will not only afford sufficient nourishment to recruit the strength of the animal, but keep the bowels gently open. If the weakness be not great, no further medicine will be wanted, except a dose of mild physic, to prevent the swellings or eruptions which sometimes succeed to strangles. In cases of debility, a small quantity of tonic medicine, as camomile, and gentian with ginger, in doses of a couple of drachms, may be administered.

As strangles seem to be a disease from which few horses escape, and which, although attended with little danger, is sometimes tedious in its progress, and accompanied by much debility, some foreign veterinary surgeons have endeavoured to produce a milder disorder by inoculating, either with the matter from the tumour, or the discharge from the nose; and it is said that a disease, with all the characters of strangles, but shorter and milder in its course, has supervened. English practitioners have not, we believe, tried the experiment.

CANKER AND WOUNDS IN THE MOUTH.

The mouth is injured much oftener than the careless owner suspects, by the pressure of a sharp bit. Not only are the bars wounded and deeply ulcerated, but the lower jaw between the tush and the grinders is sometimes torn even to the bone, and the bone itself affected, and portions of it come away. It may be necessary to have a sharp bit for the headstrong and obstinate beast, yet if that be severely and unjustifiably called into exercise, the animal may rear, and endanger himself and his rider; but there can be no occasion for a thousandth part of the torment which the trappings of the mouth often inflict on a willing and docile servant, and which either render the mouth hard, and destroy all the pleasure of riding, or cause the horse to become fretful or vicious.

Small ulcers are sometimes found in various parts of the mouth, said to be produced by rusty bits, but oftener arising from contusions inflicted by the bit, or from inflammation of the mouth. If the curb-bit is in fault, a snaffle or Pelham bit should be used; if there be inflammation of the mouth, a little cooling medicine may be administered; and to the ulcers themselves, tincture of myrrh, diluted with an equal quantity of water, or an ounce of alum dissolved in twenty times the weight of water, may be applied with advantage.

THE PHARYNX.

Proceeding to the back of the mouth, we find the PHARYNX (*carrying* or *conveying* the food towards the stomach.) It begins at the root of the tongue, (see 7, 8, and 9, p. 68;) is separated from the mouth by the soft palate (7) which hangs down from the palatine bone at 8, and extends to the epiglottis or covering to the windpipe. When the food has been sufficiently ground by the teeth, and mixed with the saliva, it is gathered together by the tongue, and then by the action of the cheeks and tongue and back part of the mouth, forced against the soft palate, which giving, way, and being raised upwards towards the entrance into the nose, prevents the food from going that way. It passes to the pharynx, and the soft palate falling down again, prevents its return to the mouth, and prevents, likewise, except in extreme cases, the act of vomiting in the horse. Whatever is returned from the stomach of the horse, passes through the nose, as the cut will make evident.

The sides of the pharynx are lined with muscles which now begin powerfully to contract, and by that contraction the bolus is forced in until it reaches the gullet (10), which is the termination of the pharynx. Before, however, the food reaches the gullet, it has to pass over the entrance into the windpipe (3), and should any portion of it enter into that tube, much nconvenience and danger might result; therefore, this opening is not only ined by muscles by which it may be closed at the pleasure of the animal, but it is likewise covered by a heart-like elastic cartilage, the epiglottis (2), with its back towards the pharynx, and its hollow towards the aperture. The epiglottis yields to the pressure of the bolus passing over it, and lies flat on the entrance into the windpipe, and prevents the possibility of any thing entering into it; and no sooner has the food passed over it, than it rises again by its own elasticity, and leaves the upper part of the windpipe once more open for the purpose of breathing. The voice of animals is produced by the passage of air through this aperture, communicating certain vibrations to folds of the membrane covering the part, and these vibrations are afterwards modified in their passage through the cavities of the nose. To understand the diseases of these parts, we must consider the anatomy of the neck generally.

Chapter IX.

THE ANATOMY AND DISEASES OF THE NECK AND NEIGHBOURING PARTS.

The neck of the horse and of every animal belonging to the class *mammalia*, except one species, is composed of seven bones, called *vertebræ*, moveable or turning upon each other (see cut, p. 63). They are connected together by strong ligaments, and form so many distinct joints, in order to give sufficiently extensive motion to this important part of the body. The bone nearest to the scull is called the *atlas*, (see cut, p. 63, and *g*, p. 68,) because, in the human being, it supports the head. In the horse, the head is suspended from it. It is a mere ring-shaped bone, with broad projections sideway; but without the sharp and irregular processes which are found on all the others. The *pack-wax*, or ligament, by which the head is principally supported (*f*, p. 68), and which is strongly connected with all the other bones, passes over this without touching it, by which means the head is much more easily and extensively moved. The junction of the atlas with the head is the seat of a very serious and troublesome ulcer, termed

POLL-EVIL.

From the horse rubbing and sometimes striking his poll against the lower edge of the manger, or hanging back in the stall, and bruising the part with the halter; or from the frequent and painful stretching of the ligaments and muscles, by unnecessary tight reining, and occasionally, we fear, from a violent blow on the poll, carelessly or wantonly inflicted, inflammation comes on, and a swelling appears, hot, tender, and painful. We have just stated, that the ligament of the neck passes over the atlas, or first bone, without being attached to it, and the seat of inflammation is between the ligament, and the bone beneath; and being thus deeply situated, it is serious in its nature and difficult of treatment.

The first thing to be attempted is to abate the inflammation by bleeding, physic, and the application of cold lotions to the part. By these means the tumour will sometimes be dispersed. This system, however, must not be pursued too far. If the swelling increases, and the heat and tenderness likewise increase, matter will form in the tumour; andthen our object still be to hasten its formation by warm fomentations, poultices, or wimulating embrocations. As soon as matter is formed, which may be known by the softness of the tumour, and before it has time to spread around and eat into the neighbouring parts, it should be evacuated: and now comes the whole art of treating poll-evil; *the opening into the tumour must be so contrived that all the matter shall run out*, and continue afterwards to run out as it is formed, and not collect at the bottom of the ulcer, irritating and corroding it. This can be effected by a seton alone. The needle should enter at the top of the tumour, penetrate through its bottom, and be brought out at the side of the neck, a little below the abscess. Without any thing more than this, except frequent fomentation with warm water, to keep the part clean, and to obviate inflammation, poll-evil, in its early stage, will frequently be cured. If the ulcer has deepened and spread, and threatens to eat into the ligaments of the joints of the neck, it may be necessary to stimulate its surface, and perhaps painfully so, in order to bring it to a healthy state, and dispose it to fill up; and, in extreme cases, even the scalding mixture of the farrier may be called into requisition. This, however, will be ineffectual, except the pus or matter is enabled, by the use of setons, perfectly to run out of the wound; and the application of these setons will require the skill and anatomical knowledge of the veterinary surgeon. In very desperate cases, the wound may not be fairly exposed to the action of our caustic applications, without the division of the ligament of the neck, by which we have described the head as being almost entirely supported. This, however, may be done with perfect safety, for although the ligament is carried on to the occipital bone, and some strength is gained by this prolongation of it, the main stress is on the second bone; and the head will continue to be supported, although the ligament should be divided between the second bone and the head. The divided ligament will soon unite again, and its former usefulness will be restored when the wound is healed.

The second bone of the neck is the *dentata*, having a process like a tooth, by which it forms a joint with the first bone. In the formation of that joint, a portion of the spinal marrow, which runs through a canal in the centre of all these bones, is exposed, or covered only by ligament; and by the division of the marrow at this spot, an animal is instantly and humanely destroyed. The operation is called *pithing*, from the name (*the pith*) given by butchers to the spinal morrow.

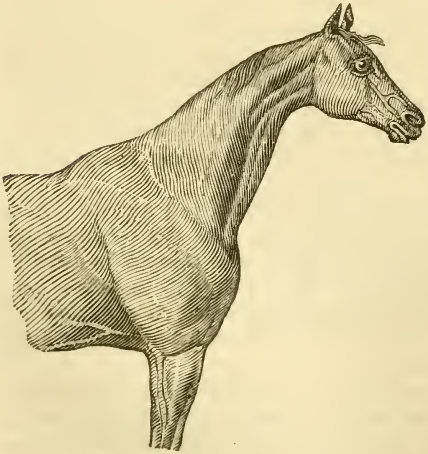
The other neck, or *rack* bones, as they are denominated by the farrier, B, p. 63, are of a strangely irregular shape, yet bearing considerable resemblance to each other. They consist of a central bone, perforated for the passage of the spinal marrow, with a ridge on the top, for the attachment of the ligament of the neck, and four irregular plates or processes from the sides, for the attachment of muscles; at the base of one of which, on either side, are holes for the passage of large arteries and veins. At the upper end of each, is a round head or ball, and at the lower end, a cavity or cup, and the head of the one being received into the cup of the other, they are united together, forming so many joints. They are likewise joined together by ligaments from these processes, as well as the proper ligaments of the joints, and so securely, that no dislocation can take place between any of them, except the first and second, the consequence of which would be the immediate death of the animal.

The last, or seventh bone, has the elevation on the back or top of it continued into a long and sharp prolongation (*a spinous process*); and is the beginning of that ridge of bones denominated *the withers* (see cut, p. 63); and as it is the base of the column of neck-bones, and there must be great pressure on it from the weight of the head and neck, it is curiously contrived to rest upon and unite with the two first ribs, which also we shall presently describe as being very peculiarly and strongly constructed.

THE MUSCLES AND PROPER FORM OF THE NECK.

The bones which we have just mentioned serve as the frame-work to which are attached numerous muscles concerned in all the motions of the head and neck. The power of the ligament of the neck is precisely adapted to the weight of the head and neck. They are supported by it, without muscular aid, and without fatigue to the animal; but to raise the head higher, or to lower it, or to turn it in every direction, a complicated system of muscles was necessary. Those, whose office it is to raise the head, are most numerous and powerful, and are placed on the upper and side part of the neck. Our cut, p. 119, gives a few of them.

c marks a tendon common to two of the most important of them, the *splenius*, or splint-like muscle, and the *complexus major*, or larger complicated muscle. The *splenius* constitutes the principal bulk of the neck above, arising from the ligament of the neck all the way down it, and going to the processes of all the bones of the neck, but the first, and flat tendons running from the upper part of it, to the first bone of the neck, and to a process of the temporal bone of the head. Its action is sufficiently evident, namely, very powerfully to elevate the head and neck. The principal beauty of the neck depends on this muscle. It was admirably developed in the horse of whose neck the annexed cut gives an accurate delineation.



If the curve were quite regular from the poll to the withers, we should call it a perfect neck. It is rather a long neck, and we do not like it the less for that. In the carriage horse, a neck that is not half concealed by the collar is indispensable, so far as appearance goes; and it is only the horse with a neck of tolerable length, that will bear to be reined up, so as to give this part that arched and beautiful appearance which fashion demands. It is no detriment to the riding horse, and there are few horses of extraordinary speed, which have not the neck rather long. The race horse at the top of his speed not only extends it as far as he can, that the air-passages may be as straight as he can make them, and that he may therefore be able to breathe more freely, but the weight of the head and neck, and the effect increasing with their distance from the trunk, add materially to the rapidity of the animal's motion, by throwing his weight considerably forward. It has been said, that a horse with a long neck will bear heavy on the hand. We do not believe that either the length of the neck, or even the bulk of the head, has any influence in causing this. They are both counterbalanced by the power of the ligament of the neck. The *setting on* of the head is most of all connected with heavy bearing on the hand, and a short-necked horse will bear heavily, because, from the thickness of the lower part of the neck, consequent on its shortness, the head cannot be rightly placed. The head and neck, however, should be proportioned to each other. A short head on a long neck, or a long head on a short neck, would equally offend the eye.

Connected with this *splenius* muscle, and partly produced by it, we would direct the attention of the reader to the thickness and muscularity of the neck in this cut, as it springs from the shoulders; the height at which it comes out from them, forming nearly a line with the withers; and the manner in which it tapers as it approaches the head, and this muscle diminishing in size. The neck of a well formed horse, however fine at the top, should be muscular at the bottom, or the horse to which it belongs will generally be weak and worthless. Necks devoid of this muscularity are called *loose* necks by horsemen, and are always considered a very serious objection to the animal. If the neck be thin and lean at the upper part, and be otherwise well-shaped, the horse will usually carry himself well, and the head will be properly curved for beauty of appearance, and ease of riding. When an instance to the contrary occurs, it is to be traced to very improper management, or to the space between the jaws being unnaturally small.

The *splenius* muscle, although a main agent in raising the head and neck, may be too large, or covered with too much cellular substance or fat, and give an appearance of heaviness or even clumsiness to the neck. This peculiarity of form constitutes the distinction between the perfect horse and the mare, and also the gelding, unless castrated at a very late period. Horses with thick, heavy crests are usually slow and sluggish.

This tendon, *c*, belongs also to another muscle, which make sup the principal bulk of the lower part of the neck, and is called the *complexus major*, or larger complicated muscle. It arises partly as low as the transverse processes of the four or five first bones of the back, and from the five lower bones of the neck; and the fibres from these various sources uniting together, form a very large and powerful muscle, the largest and strongest in the neck. As it approaches the head, it lessens in bulk, and terminates partly with the splenius in this tendon, but is principally inserted into the back part of the occipital bone, by the side of the ligament of the neck. In our cut, p. 154, almost its whole course can be distinctly traced. Its office is to raise the neck and elevate the head; and being inserted into such a part of the occiput, it will more particularly protrude the nose, while it raises the head. Its action, however, may be too powerful; it may be habitually so, and then it may produce deformity. The back of the head being thus pulled back, and the muzzle protruded, the horse cannot by possibility carry his head well; he will become what is technically called a star-gazer;—heavy in hand, boring upon the bit, and unsafe. To remedy this, recourse is had, and in the majority of cases without avail, to the martingale, against which the horse is continually fighting, and which is often a complete annoyance to the rider. Such a horse is almost useless for harness.

Inseparable from this is another sad defect, so far as the beauty of the horse is concerned;—he becomes *ewe-necked*;—he has a neck like a ewe—not arched above, and straight below, until near to the head, but hollowed above and projecting below; and the neck rising low out of the chest, even lower sometimes than the points of the shoulders. There can scarcely be anything more unsightly in a horse. The head of such a horse can never be got down; and the bearing rein of harness must be to him a source of constant torture.

Among the muscles employed in raising the head, are the *complexus minores*, smaller complicated, and the *recti*, straight, and the oblique muscles of the upper part of the neck, and belonging principally to the two first bones of the neck, and portions of which may be seen under the tendon of the *splenius* *c*, and between it and the ligament *a*.

Among the muscles employed in lowering the head, some of which are given in the same cut, is the *sterno-maxillaris*, *d*, belonging to the breast-bone, and the upper jaw. It can likewise be traced, although not quite distinctly, in the cut, page 154. It lies immediately under the skin. It arises from the cartilage projecting from, or constituting the front of the breast-bone, (H, p. 63), and proceeds up the neck, of no great bulk or strength; for when the weight of the head is so nicely balanced by the power of the ligament, a little addition to that weight will pull it down; whereas, the muscles that raise the head must necessarily have very great strength, for they will have all its weight to support. About three-fourths of its length upward, it changes to a flat tendon, which is seen (*d*, p. 119) to insinuate itself between the parotid and submaxillary glands, in order to be inserted into the angle of the lower jaw. It is used in bending the head towards the chest.

Another muscle, the termination of which is seen, is the *levator humeri*, raiser of the shoulder, *b*. This is a much larger muscle than the last, because it has more duty to perform. It rises from the back of the head and four first bones of the neck and the ligament of the neck, and is carried down to the shoulder, mixing itself partly with some of the muscles of the shoulder, and finally continued down to and terminating on the humerus (J, p. 63). Its office is double: if we suppose the horse in action, and the head and neck fixed points, the contraction of this muscle will draw forward the shoulder and arm: if the horse be standing, and the shoulder and arm be fixed points, this muscle will depress the head and neck.

Little more of a practical nature could be said of the muscles of the neck, although they would be proper and interesting studies for the anatomist; and therefore we will only observe that they are all in pairs. One of them is found on each side of the neck, and the office which we have attributed to them can only be accomplished when both act together; but supposing that one alone of the elevating muscles should act, the head would be raised, but it would at the same time be turned towards that side.

If one only of the depressor muscles were to act, the head would be bent down, but it would likewise be turned towards that side. Then it will be easily seen that by this simple method of having the muscles in pairs, provision is made for every kind of motion, upwards, downwards or on either side, for which the animal can possibly have occasion.

This is the proper place to speak of the *mane*, that long hair which covers the crest of the neck, and adds so much to the beauty of the animal. It sometimes grows to a considerable length. There is a horse in the king's stables, the hair of whose mane is more than a yard in length; and it is said that a horse was once exhibited with a mane three or four yards long. The mane is apt to become entangled, if it be not regularly combed. The teeth of the comb should be large, and sufficiently far apart. There never can be occasion to pull the mane, as grooms are too much accustomed to do, tugging it out in little parcels. It will then never lie smooth. A strong comb, with only two or three teeth in it, will keep it sufficiently thin and smooth.

THE BLOOD-VESSELS OF THE NECK.

Running down the inner part of the neck are the principal blood-vessels going to and returning from the head, with the windpipe and gullet. Our cut could not give a view of the *arteries* which carry the blood from the heart to the head, because they are too deeply seated. The external arteries are the *carotid*, of which there are two. They ascend the neck on either side, close to the windpipe, until they have reached the middle of the neck, where they somewhat diverge, and lie more deeply; they are covered by the sterno-maxillaris muscle, which we have just described; and are separated from the jugulars by a small portion of muscular substance. Having reached the larynx, they divide into two branches, the external and the internal; the first goes to every part of the face, and the second, to the brain.

The vertebral arteries run through canals in the bones of the neck, supplying the neighbouring parts as they climb, and at length enter the scull at the large hole in the occipital bone, and ramify on and supply the brain.

We can conceive few cases in which it would be either necessary or justifiable to bleed from an artery. Even in mad-staggers the bleeding is more practicable, safer, and more effectual, from the jugular vein than from the temporal or any other artery. If an artery be opened in the direction in which it runs, there is sometimes very great difficulty in stopping the bleeding; it has even been necessary to tie the vessel in order to accomplish this purpose. If the artery be cut across, its coats are so elastic that the two ends are immediately drawn apart under the flesh on each side, and are thereby closed; and after the first gush of blood no more can be obtained.

THE VEINS OF THE NECK.

The external veins which return the blood from the head to the heart are the jugulars. The horse has but one on either side. The human being and the ox have two. It is the principal vessel by which the blood is conveyed from the head. The jugular is said to take its rise from the base of the scull; it then descends, receiving other branches in its way towards the angle of the jaw, and behind the parotid gland; and emerging from that, as seen at *t*, p. 120, and being united to a large branch from the face, it takes its course down the neck. Veterinary surgeons and horsemen have agreed to adopt the jugular, a little way below the union of these two branches, as the place for bleeding; and a very convenient one it is; for it is easily got at, and the vessel is large. Of the manner of bleeding, and the states of constitution and disease in which it is proper, we shall speak hereafter, confining ourselves at present to an occasional consequence of bleeding, namely,

INFLAMMATION OF THE VEIN.

It is usual and proper, after bleeding, to bring the edges of the cut carefully together, and to hold them in contact by inserting a pin through the skin, with a little tow twisted round it. In ninety-nine cases out of a hundred the wound quickly heals, and gives no trouble; but in a few instances, from using a blunt instrument, or a dirty or rusty one; or striking too hard, and bruising the vein with the thick part of the fleam; or pulling the skin too far from the neck, and suffering some blood to insinuate itself into the cellular texture; or neglecting to tie the horse up for a little while, and thereby enabling him to rub the bleeding place against the manger, and tear out the pin; or from the animal being worked immediately afterward, and the collar pressing the blood against the orifice; or the reins or the bridle rubbing against it; or having several blows clumsily given, and a large and ragged wound made; or from some disposition to inflammation about the horse, for the bleeder is not always in fault, the wound does not heal. The edges of it separate, and are swelled and red; a discharge of thin bloody fluid proceeds from the cut, followed perhaps in a few days by matter; the neck swells, and is hot and tender; the vein, particularly above the wound, is hard and cordy; the cordiness of the vein increases more and more upward; and little abscesses begin to form about the original wound. This is sometimes a very serious case, for the inflammation continues to spread upwards, and destroys the horse. It is easy to imagine why it spreads upward, because the blood has run off below the wound, and nothing remains there to irritate; but the vein becoming thickened in its coats, and diminished in its capacity, and at length quite closed by the inflammation, the blood descending from the head, and pressing upon the closed part, will coagulate; and that clot of blood will gradually increase, and the obstruction, and the inflammation produced by that obstruction, will increase, and that necessarily upward.

Human surgeons say that inflammation of a vein spreads *towards* the heart. In the horse, and we will venture to say in every animal, it spreads in the direction in which the coagulation is formed, and that in the jugular must be upward, although *from* the heart. In the veins of the arm and leg it will likewise spread upward, and then *towards* the heart, because the coagulation takes place in that direction.

The application of the hot iron to the orifice of the wound will sometimes stimulate it, and cause its edges to unite. When this fails, and the swelling is large, and abscesses have formed, it is for the veterinary surgeon to decide how far he will introduce setons into them, or inject a caustic liquid, or dissect out the diseased portion of the vein.

Should the vein be destroyed, the horse will not be irreparably injured; and perhaps, at no great distance of time, scarcely injured at all; for nature is ingenious in making provision to carry on the circulation of the blood. All the vessels conveying the blood from the heart to the different parts of the frame, or bringing it back again to the heart, communicate with each other by so many channels, and in such various ways, that it is impossible by the closure or loss of any one of them materially to impede the flow of the vital current. If the jugular be destroyed, the blood will circulate through other vessels almost as freely as before.

THE WINDPIPE.

In the fore part of the throat (*b*, p. 68) is placed a curiously constructed tube, extending from the back part of the mouth to the lungs, and designed for the conveyance of air to and from these organs. The windpipe of the horse is composed of nearly sixty rings of cartilage, connected together by strong and elastic ligaments. The rings are broad in front, narrowing behind, and there overlapping each other, so as to be capable of considerable extension and contraction; and across the posterior part run strong muscular fibres, which give to that portion of the tube a power of action, depending not indeed on the will, but on sympathy with other parts concerned in breathing.

This singular and beautiful mechanism deserves serious attention. It is necessary for the comfort, and even the existence of the animal, that this air-tube should be free from compression, and always open; and it is attached to the neck, long, and capable of the most varied motion. Would any tube composed of an uniform substance, however elastic, maintain its form and size amidst all these complicated motions? When the horse is browsing, the windpipe is an inch or more longer than when the neck is arched; there is, therefore, the ligamentous substance between the circular rings, which will lengthen the tube when required, and immediately contract to its former dimensions when the force that caused the elongation is removed. When the head is bent, and the neck is arched, and in various positions of the neck, a portion of the windpipe is violently pressed upon; therefore there are the cartilaginous rings—cartilaginous that they may yield to pressure, and immediately recover their form when the pressure is removed; and lapping over each other, that the difference of calibre or size in the tube may be as great as the necessities of the animal may occasionally require, and muscular at the back, that all these powers of elasticity may be exerted to the fullest extent. The cartilaginous rings, again, are broad and strong in front where danger may threaten, and softer and more yielding behind, where the bones of the neck afford secure protection.

The windpipe is lined by a membrane, likewise curiously contrived. It is smooth and plain in front under the broad cartilaginous rings, and where little change of dimension can take place; but behind, it is puckered into several folds, running down the windpipe, and not across it, and adapting itself easily to any change in the size of the tube.

Then it is easy to imagine that the windpipe of a good horse should be large to admit the passage of a greater quantity of air; and in horses from which speed is required, as in the blood-horse, the windpipe is comparatively larger than in other breeds devoted to slower work.

The windpipe should project from the neck. It should be as it were detached from the neck, for two important reasons; first, that it may easily enter between the channels of the jaw, so that the horse may be reined up without suffering inconvenience; and, next, that being more loosely attached to the neck, it may more readily adapt itself to the changes required, than if it were enveloped by fat or muscle, to a certain degree unyielding: therefore, in every well-formed neck, and it will be seen in the cut, (p. 154,) it is indispensable that the windpipe should be prominent and loose on the neck. We do not require this in the heavy cart-horse, and we do not often find it, because he is not so much exposed to those circumstances which will hurry respiration, and require an enlargement in the size of the principal air-tube.

THE LARYNX.

At the top of the windpipe is placed the *larynx*, which has been partially described. It is situated where, from the sudden bending or motion of the head, it is liable to more frequent and to greater injury than the windpipe; and therefore it is composed of stronger cartilages than that tube. First is the *thyroid*, or helmet-shaped cartilage, forming the front and side parts of the larynx, and protecting the other parts of the larynx (see 1, p. 68.) Its bulk and strength are apparent on the slightest handling.

Immediately below the thyroid, and with its broad part behind, is the *cricoid*, ring-like cartilage (11, p. 68.) This is likewise for the purpose of strength in a part so exposed to injury, but not so strong as the thyroid because so much danger cannot threaten from behind. Of the epiglottis, or covering of the entrance into the windpipe (2, p. 68,) and of the arytenoid, or funnel-shaped cartilages forming that opening (3, p. 68), we have already spoken.

ROARING.

The larynx and upper part of the windpipe are subject to various diseases. The first we shall mention is Roaring; so called from a peculiar sound uttered by the horse when briskly trotted or galloped, particularly up hill. In moderate exercise it is scarcely, or not at all perceived, but when the animal is in brisk exercise it may be heard at the distance of several yards. It may be easily detected by striking the horse suddenly, or even threatening him with a stick, when he will utter a singular grunt or groan.

It usually is explained as the consequence of inflammation of the part. A fluid, rapidly changing into a tough viscid substance, is thrown out, and adheres to the sides of the larynx and upper part of the windpipe, materially obstructing the passage, and sometimes running across it in bands. When the horse is blown, or his breathing much hurried, the air whistles through these obstructions. We believe this to be the most general cause of the disease, and a roarer is evidently unsound, for he is incapable of the exertion which may not only be occasionally, but ordinarily required of him.

Much light, however, has lately been thrown on other causes of this complaint. Many roarers have been examined after death, and no vestige of these bands has been found; but some have had the shape of the larynx and upper part of the windpipe materially deformed, crooked, and compressed; and others have presented no appearance of disease. Then we have been compelled to look out for other causes of roaring, and some very probable ones have been readily found. The parts may have been subject to inflammation, and some parts of the air-tube may have become thickened and inelastic. In this way the inflammation of strangles may have been communicated to the larynx or windpipe, followed by some alteration of structure. Roaring is no unusual consequence of strangles.

A more frequent cause, and previously unsuspected, is tight reining. There can be no doubt that many more carriage-horses become roarers, than those that are used for the saddle alone; and the explanation of this at once presents itself in the continued and painful pressure on these parts, caused by reining in the carriage-horse, and teaching him to bear himself well. We have seen the larynx, and that portion of the windpipe immediately beneath it, flattened, and bent, and twisted in the strangest way, which could not have been produced by disease, but by mechanical injury alone. The mischief is usually done with young horses. The arched neck and elevated head of the carriage-horse is an unnatural position, from which the animal, most habituated to it, is eager to be relieved. Horse-breakers, and coachmen, and carters, should be made to understand, that when the horse's head is first confined by the bearing rein, great gentleness, and care, and caution, are necessary. Injury must be done if the throat be violently pressed upon, and especially when it is exposed to additional danger, from the impatience of the animal, unused to controul, and suffering pain. The head of the riding-horse is gradually brought to its proper place by the hands of the teacher, who skilfully increases, or relaxes the pressure, and humours and plays with the mouth ; but the poor carriage-horse is confined by a rein that never slackens, and his nose is bent in at the expense of the larynx and windpipe, and the injury is materially increased, if the head be not naturally well set on, or if the neck be thick, or the jaws narrow.

The shape of the larynx and wind-pipe will occasionally be altered, if they be thus squeezed between the jaws, and the bones of the neck ; or the muscles which expand the opening into the windpipe for the purpose of natural breathing, and especially of quick and hurried breathing, will be so compressed, that they will be incapable of full action, and by degrees will lose the power of action, even when not pressed upon, and, in fact, become palsied ; and therefore, the opening not being sufficiently enlarged during the rapid breathing of the animal, moving with speed, the air will rush violently through the diminished aperture, and the sound termed *roaring* will be produced.

It is a common opinion that crib-biting frequently terminates in roaring. There is nothing in crib-biting that can possibly lead to roaring ; but there is a method adopted to cure crib-biting, than which nothing can be more likely to produce it : we mean the straps which are so tightly buckled round the upper part of the neck, and which must compress, and sometimes distort or paralyse the larynx.

The habit of *coughing* a horse, to ascertain the state of his wind, is an occasional cause of roaring. The larynx or trachea is violently and painfully squeezed in this operation ; and the violence being often repeated, inflammation and injury may ensue.

The treatment of roaring is very unsatisfactory. If we have been correct in our account of the nature and cause of the disease, a cure seems to be perfectly out of the question. If it arise from a distorted larynx, there is no mechanical contrivance that can restore the natural and perfect structure ; if from a band or ring of lymph diminishing the size of the passage, we know not by what means that can be removed ; or if the muscles of the larynx be palsied, we know not the stimulus that can rouse them again to action, or the manner in which that stimulus is to be applied.

In the early stage of the disease, whether it proceed from violent pressure on the part by improper curbing, or be connected with, or consequent on catarrh or strangles, or the enlargement of some neighbouring part, inflammation will be present, and we shall be justified in having recourse to those measures which will abate inflammation. Bleeding will not be improper if roaring is the consequence of previous disease ; it will be indispensable, if it be connected with present disease of the chest. The degree to which the bleeding should be carried, will depend on the degree of general or local inflammation. To bleeding should succeed purging, and to this, medicines that will lessen the force of the circulation,—as nitre, emetic-tartar, and digitalis. These should be followed by blisters, to remove the inflammation, if possible, from an internal and important part to the skin. The blisters may at first be confined to the upper part of the throat, but, if unsuccessful there, they should extend over the whole length of the wind-pipe. In extreme cases, and where the obstruction seems to threaten suffocation, we may be justified in cutting into the wind-pipe, and either introducing a tube into the opening, or cutting out a portion of one of the rings. This operation, however, the agriculturist will scarcely dare to perform, although it is simple enough to him who understands the anatomy of the neck. It is called *bronchotomy.* By means of it, the animal will be enabled to breathe through an aperture below the seat of inflammation, or the distorted and obstructed part; and time will be given for the adoption of other modes of relief or cure. Some practitioners have talked of cutting into the wind-pipe, to extract the band or ring of coagulated matter that obstructs the passage; we can only say, that if they happen to hit upon the precise situation of this ring or band, they will be more fortunate than their folly deserves.

Another circumstance should be mentioned, and the breeder should not forget it, that the roarer, whether horse or mare, will often entail this disease on its progeny. This entailment of disease by the parent on the offspring is a subject which has not sufficiently engaged the attention, or entered into the calculation, of the agriculturist.

THE ŒSOPHAGUS, OR GULLET.

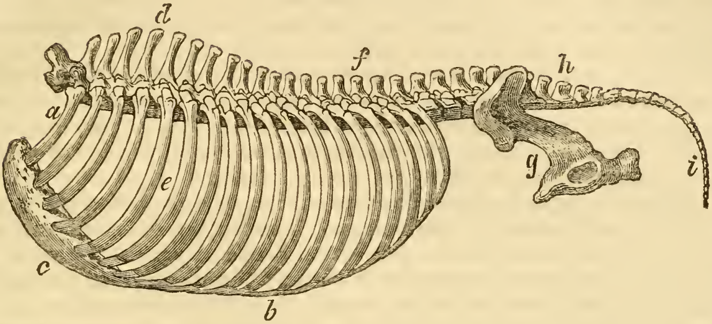
The gullet extends from the back part of the mouth to the stomach, and conveys the food from the one to the other. At the top of the neck, it is immediately behind the wind-pipe, but it soon inclines to the left, and runs down the neck close to the wind-pipe, and on its left; therefore when we give a ball to a horse, we watch the left side of the neck to see whether it passes down the gullet. Having entered the chest between the first two ribs, the gullet passes along the upper part of it, and then piercing the diaphragm, or midriff, enters the stomach. It is composed of three coats —the outer one of slight loose cellular substance: the middle one muscular, and divided into two distinct layers, the outermost layer having the fibres lengthways, by which the gullet may be shortened, and in shortening, widened for the reception of the food;—the fibres of the inner layer running circularly round the tube, so that the portion immediately above a pellet of food, will by its contraction force the food downward, and by successive actions drive it into the stomach. The inner coat, which is a continuation of the membrane of the pharynx, lies in folds or plaits, extending lengthways. The muscular coat being highly elastic, readily gives way to the pressure of the food, and these plaits enable the inner or cuticular coat, likewise, sufficiently to dilate.

The gullet has in a few cases been strictured, or contracted in some part, so that the food could only be swallowed in small quantities, and with great difficulty. If the stricture be near the entrance into the stomach, there is no remedy, for the part cannot be got at. If it be higher up, a veterinary surgeon alone can determine how far relief is practicable. Substances have sometimes stuck in the gullet. Bran and chaff swallowed greedily, or too large or hard a ball, have remained in some part of the gullet, and caused very alarming symptoms. The tube used for the hove in cattle, will sometimes dislodge this foreign substance; but should this be impracticable, the gullet must be opened, which a scientific practitioner alone is competent to perform.

CHAPTER X.

THE CHEST AND ITS CONTENTS—THE HEART AND THE LUNGS.

CUT OF THE CHEST.



a The first rib.

b The cartilages of the eleven hindermost, or *false* ribs, connected together, and uniting with that of the seventh or last *true* rib.

c The breast-bone.

d The top or point of the withers, which are formed by the lengthened spinous, or upright processes of the ten or eleven first bones of the back. The bones of the back are eighteen in number.

e The ribs, usually eighteen on each side; the seven first united to the breast-bone by cartilage; the cartilages of the remaining eleven united to each other, as at *b*.

f That portion of the spine where the loins commence, and composed of five bones.

g The bones forming the hip or haunch, and into the hole at the bottom of which the head of the thigh-bone is received.

h The portion of the spine belonging to the haunch, and consisting of five pieces.

i The bones of the tail, usually thirteen in number.

THE form of the chest is of the greatest importance. It contains the heart and the lungs;—the one employed in circulating the blood, and the other in restoring to it the power of supporting life; and on the size and the soundness of these organs, the health and the strength of the animal principally depend. The speed and wind of the horse are most intimately connected with the size of the lungs. In proportion to the quantity of air which they contain, and the less frequent necessity of renewing that air by the act of breathing, will the animal be at his ease, or distressed, when violent exertion is demanded of him. Therefore, one of the first things which the judge of the horse examines, is the capacity of the chest; and if he finds considerable depth in the girth, and roundness behind the point of the elbow;—the horse carrying what is called a good barrel;—he is satisfied as to the *capacity* of the chest. The *form* of the chest has as much to do with the value of the horse as its capacity. An ox may have a chest rounded before as well as behind, and then there will be room enough for the heart to circulate, and the lungs to purify sufficient blood to clothe him with all the muscle and fat he was intended to yield: we require from him no speed, and, therefore, his legs will not fail him, should too much weight be thrown on them, nor will he be disposed to stumble and fall. One principal quality of the horse, however, is his speed; and if undue weight be thrown before, his legs and feet will be battered, and injured, and worn out by the unavoidable concussion to which they will be exposed in the trot or the gallop; and likewise the centre or bulk of his weight will be too easily thrown beyond the natural situation of his feet, and he will be exceedingly unsafe. Therefore, for the light carriage and the saddle, although we want capacity of chest, we want it not too much before. A moderate breadth, with depth at the girth, and a swelling out, or barrelling behind the elbow, will be the most desirable form. Horses with narrow chests may have plenty of spirit, and willingness for work; but they have not the appetite or the endurance of those whose breast is moderately wide.

The heavy cart or dray horse, whose power of draught is equal to the weight which he can throw into the collar, requires the broad chest, not only that his weight may be thrown more before, but that by the increased capacity of his chest he may obtain that bulk and size which will enable him to press with the requisite force upon the collar.

Depth of chest has another advantage; it not only gives increased capacity to the cavity within it, but increased room for the insertion of those muscles on and between the ribs, by the action of which, the chest is alternately expanded and contracted in the act of breathing; and the action of which is so necessary when the breathing is quickened by exercise.

Again, depth of chest will admit of a great deal more increased expansion, than will a chest approaching to a circular form. That which is somewhat straight may be easily bent into a circle; but that which is already rounded can scarcely be made more so: therefore it is that the heavy horse, with all his capaciousness of chest, is easily blown, and incapable of speed, because all this expanse was employed in the accumulation of flesh and fat, and can be very little increased when exertion causes the flow and the change of blood to be considerably more rapid. The flatter chest may be readily expanded as the circumstances of the animal may require. A judge of the horse never likes to see a chest too high from the ground, and legs too long. The animal may be free and speedy, but there is not sufficient capacity of chest to render him a good feeder, or to give him much endurance.

The next point of consequence regarding the capacity of the chest, is the length or shortness of the carcase; or the extent of the ribs from the elbow backward. Some horses are what is called *ribbed home;* there is but little space (see cuts pp. 63 and 163) between the last rib and the hip-bone. In others the distance is considerably greater, which is evident by the falling in of the flank. The question here is, what service is required from the horse? If he have to carry a heavy weight, and much work to do, let him be ribbed home,—let the last rib, and the hip-bone be almost close to each other. There is more capacity of chest and of belly; there is less distance between the points of support; there is more strength and endurance. A hackney (and we would almost say a hunter) can scarcely be too well ribbed home.

If speed, however, be required, there must be room for the full action of the hinder limbs; and this can only exist when there is sufficient space between the last rib and the hip-bone. The owner of the horse must make up his mind as to what he wants from him, and be satisfied if he obtains that; but let him be assured that he cannot have every thing: this would require those differences of conformation which cannot possibly exist in the same animal.

The thorax, or chest, is formed by the spine *f*, above; the ribs *e*, on either side; and the sternum, or breast-bone, *c*, beneath.

THE SPINE AND BACK.

The spine or back-bone consists of a chain of bones from the poll to the extremity of the tail. We have described the bones of the neck, and we will now proceed to that portion of the spine which forms the roof of the chest and belly. It consists of twenty-three bones from the neck to the haunch; eighteen, called *dorsal vertebræ*, composing the back; and five *lumbar vertebræ*, occupying the loins. On this part of the animal the weight or burden is laid, and there are two principal things to be considered, easiness of carriage, and strength. If the back were composed of unyielding materials, if it resembled a bar of wood or iron, the jar or jolting, in the rapid motion of the animal, could not possibly be endured. To avoid this, as well as to assist in turning, the back is divided into numerous bones; and between each pair of bones, there is interposed a cartilaginous substance, most highly elastic, which will yield and give way to every jar, not so much as to occasion insecurity between the bones, or to permit considerable motion between any one pair; yet forming altogether an aggregate mass of elasticity, so springy that the rider sits almost undisturbed, however high may be the action, or however rapid the pace.

Strength is as important as ease; therefore these bones are united together with peculiar firmness. The round head of one is exactly fitted to the cup or cavity of that immediately before it; and between them is placed the elastic ligamentous substance we have just described, so strong, that in endeavouring to separate the bones of the back, the bones will break sooner than this substance will give way. Beside this there are ligaments running along the broad under surface of these bones; ligaments between each of the *transverse* processes, or side projections of the bones; and ligaments between the *spinous* processes, or upright projections; and a continuation of the strong ligament of the neck running along the whole course of the back and loins above these, lengthening and contracting, as in the neck, with the motions of the animal, and forming a powerful bond of union between the bones.

By these means the hunter will carry a heavy man without fatigue or strain through a long chase; and those shocks and jars are avoided which would be annoying to the rider, and injurious and speedily fatal to the horse.

These provisions, however, although adequate to common or even severe exertion, will not protect the animal from the consequences of brutal usage; and, therefore, if the horse be much overweighted, or violently exercised, or too suddenly pulled upon his haunches, these ligaments are strained:—inflammation follows;—and the ligament becomes changed to bone, and the joints of the back lose their springiness and ease of motion; or rather in point of fact cease to exist. On account of the too hard service required from them, and especially before they have gained their full strength, there are few old horses, who have not some of the bones of the back or loins *anchylosed*, united together by bony matter, and not by ligament. When this exists to any considerable extent the horse is not pleasant to ride; he turns with difficulty in his stall;—he is unwilling to lie down, or when down to rise again;—and he has a curious straddling action. Such horses are said to be *broken-backed*, or *chinked in the chine*.

Fracture of the bones of the back rarely occurs, on account of their being so strongly united by ligaments, and defended by muscular substance. If a fracture of these bones does happen, it is during the violent struggles after the horse has been cast for an operation.

The length of the back is an important consideration. A long-backed horse will be easy in his paces, because the increased distance between the fore and hind legs, which are the supports of the spine, will afford greater room for the play of the joints of the back. A long spring has much more play than a short one, and will better obviate concussion. A long-backed horse is likewise formed for speed, for there is room for him to bring his hinder legs more under him in the act of gallopping, and thus more powerfully propel or drive forward the body: but, on the other hand, a long-backed horse will be weak in the back, and easily overweighted. A long spring may be easily bent and broken. The weight of the rider, likewise, placed further from the extremities, will act with mechanical disadvantage upon them, and be more likely to strain them. A short-backed horse may be a good hackney, and be able to carry the heaviest weight, and possess great endurance; but his paces will not be so easy, nor his speed so great, and he may be apt to overreach himself.

The comparative advantage of a long or short carcase depends entirely on the use for which the horse is intended. For general purposes the horse with a short carcase is very properly preferred. He will possess health and strength; for horses of this make are proverbially hardy. He will have sufficient ease not to fatigue the rider, and speed for every ordinary purpose. Length of back will always be desirable when there is more than usual substance generally, and particularly when the loins are wide, and the muscles of the loins large and swelling. The two requisites, strength and speed, will then probably be united.

The back should be depressed a little immediately behind the withers; and then continue in an almost straight line to the loins. This is the form most consistent with beauty and strength. Some horses have a very considerable hollow behind the withers. They are said to be *saddle-backed.* It seems as if a depression were purposely made for the saddle. Such horses are evidently easy goers, for this curve inward must necessarily increase the play of the joints of the back; but in the same proportion they must be weak and liable to sprain. To the general appearance of the horse, this defect is not in any great degree injurious; for the hollow of the back is uniformly accompanied by a beautifully arched crest.

A few horses have the curve outward. They are said to be *roach-backed*, from the supposed resemblance to the arched back of a roach. This is a very serious defect;—altogether incompatible with beauty, and materially diminishing the usefulness of the animal. It is almost impossible to prevent the saddle from being thrown on the shoulders, or the back from being galled;—the elasticity of the spine is destroyed;—the rump is badly set on;—the hinder legs are too much under the animal;—he is continually overreaching himself, and his head is carried awkwardly low.

THE LOINS.

The loins are attentively examined by every good horseman. They can scarcely be too broad and muscular. The strength of the back, and the strength of the hinder extremities, will depend materially on this. The breadth of the loins is regulated by the length of the transverse or side processes of that part. The bodies of the bones of the loins are likewise larger than those of the back; and a more dove-tailed kind of union subsists between these bones, than between those of the back. Every provision is made for strength here. The union of the back and loins should be carefully remarked. There is sometimes a depression between them: a kind of line is drawn across which shows imperfection in the construction of the spine, and is regarded as an indication of weakness.

THE WITHERS.

The spinous or upright processes of the dorsal vertebræ, or bones of the back, above the upper part of the shoulder, are as remarkable for their length as are the transverse or side processes of the bones of the loins. They are flattened and terminated by rough, blunted extremities. The elevated ridge which they form is called the *withers.* It will be seen in the cuts (pp. 63 and 163), that the spine of the first bone of the back has but little elevation, and is sharp and upright. The second is longer and inclined backward; the third and fourth increase in length, and the fifth is the longest;—they then gradually shorten until the twelfth or thirteenth, which becomes level with the bones of the loins.

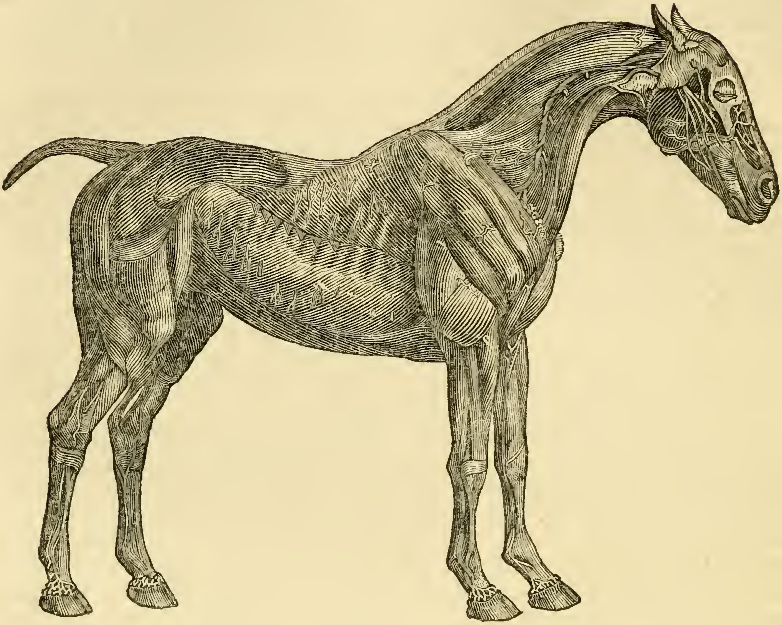
High withers have been always, in the mind of the judge of the horse, associated with good action, and generally with speed. The reason is plain enough:—they afford larger surface for the attachment of the muscles of the back; and in proportion to the elevation of the withers, these muscles act with greater advantage. The rising of the fore parts of the horse, even in the trot, and more especially in the gallop, depends not merely on the action of the muscles of the legs and shoulders, but on those of the loins, inserted into the spinous processes of these bones of the back, and acting with greater power in proportion as these processes, constituting the withers, are lengthened. The arm of the lever to which the power is applied will be longer; and we well know that in proportion to the length of this arm will be the ease with which a weight is raised. Therefore good and high action will depend much on elevated withers.

It is not difficult to understand how speed will likewise be promoted by the same conformation. The power of the horse is in his hinder quarters. In them lies the main spring of the frame, and the fore quarters are only elevated and thrown forward to receive the weight forced on them by the action of the hinder quarters. In proportion, however, as the fore-quarters are elevated, will they be thrown farther forward, or, in other words, will the stride of the horse be lengthened: they are elevated and thrown forward in proportion to the elevation of the withers, and therefore in this point of view the form of the withers is very much connected with speed. Yet many racers have the forehand low. The unrivalled Eclipse (see p. 47) was a remarkable instance of this; but the ample and finely proportioned quarters, and the muscularity of the thigh and fore-arm, rendered the aid to be derived from the withers perfectly unnecessary. The heavy draught horse does not require elevated withers. His utility depends on the power of depressing his fore-quarters, and throwing their weight fully into the collar; but for common work in the hackney, in the farmer's horse, and in the hunter, well-formed withers will be an essential advantage, as contributing to good and safe action, and likewise to speed.

MUSCLES OF THE BACK.

The most important muscles which belong to this part of the frame can be very imperfectly delineated in any cut; we have endeavoured, however, to give as complete a view of them, and of all the superficial muscles of the frame, as we could. They are principally those which extend from the continuation of the ligament of the neck, along the whole of the back and loins; and likewise from the last cervical bone;—the *superficialis* and *transversalis costarum,* or superficial and transverse muscles of the ribs, going from this ligament to the upper part of the ribs, to elevate them, and so assist in the expansion of the chest; also the large mass of muscle, the *longissimus dorsi,* or longest muscle of the back, from the spinous and transverse processes of the vertebræ to the ribs, and by which all the motions of the spine, and back, and loins, of which we have spoken, are principally produced; by which the fore quarters are raised upon the hind, or the hind upon the fore, according as either of them is made a fixed point. This is the principal agent in rearing and kicking.

CUT OF THE MUSCLES OF THE HORSE.



The last we shall mention is the *spinalis dorsi*, the spinal muscle of the back, from the spinous processes of some of the last bones of the back, to those of the fore part;—thick and strong about the withers, and broadly attached to them; and more powerfully attached, and more strongly acting in proportion to the elevation of the withers; and proceeding on to the three lowest bones of the neck, and therefore mainly concerned, as we have described, in elevating the fore-quarters, and producing high and safe action, and contributing to speed.

Before we quite leave the roof of the chest, we will speak of some accidents or diseases to which it is exposed. The first is of a very serious nature.

FISTULOUS WITHERS.

When the saddle has been suffered to press long upon the withers, a tumour will be formed, hot and exceedingly tender. It may sometimes be dispersed by the cooling applications recommended in the treatment of poll-evii (p. 153); but if, in despite of these, the swelling should remain stationary, and more especially if it should become larger and more tender, warm fomentations and poultices and stimulating embrocations should be applied diligently to it, as to the tumour of poll-evil, in order to hasten the formation of matter. As soon as the matter can be fairly detected, a seton should be passed from the top to the bottom of the tumour, so that the whole of the matter may run out, and continue to run out as it is afterwards formed. The after treatment must be precisely that which we have recommended for a similar disease in the poll.

In neglected fistulous withers the ulcer may be larger and deeper, and more destructive than in poll-evil. It may burrow beneath the shoulder-blade, and the matter may appear at the point of the shoulder or the elbow; or the bones of the withers may become carious.

WARBLES, SITFASTS, AND SADDLE GALLS.

On other parts of the back, tumours and very troublesome ulcers may be produced by the same cause. The little tumours resulting from the pressure of the saddle are called *warbles*, and when they ulcerate they frequently become *sitfasts*. The ulcer has a portion of callous skin in the centre of it, resembling leather in its appearance, and so closely adhering as not to be separated without great force or absolute dissection; and hence the name given to this peculiar ulcer. Warbles are too often but little regarded. They will frequently disappear without medical treatment, but they will, at other times, degenerate into sitfasts. If it be practicable, the horse should have rest, or, at all events, the stuffing of the saddle should be so contrived that every degree of pressure be removed from the part: then goulard and vinegar or brine should be frequently applied for the purpose of dispelling the enlargement. Should this prove ineffective, and the sitfast appear, let it by no means be torn out, but apply a mild blister which will cause it speedily to separate; and then let the wound be dressed with Friar's balsam, or Turner's cerate, or both.

For saddle galls there is no better application than strong salt and water, mixed with a fourth-part of tincture of myrrh. Common sense and common humanity would suggest the necessity of chambering the saddle and the collar, and not suffering the animal, with sore places as broad as the hand, to be unnecessarily tortured by the rubbing of the rough and hardened stuffing.

THE RIBS.

The ribs constitute the sides of the chest. They are usually eighteen on either side, and, in a few instances, nineteen or twenty. They are crooked or twisted in their figure, but so united to the spine by a true joint, the head of each rib being received between the bodies of two of the bones of the back, that they form so many arches, differing in roundness in different horses. The first rib (*a*) is placed at the base of the column of the neck, and is short and strong in order to support the weight and pressure of the head and neck, and to be a fixed point for the other ribs to act upon in expanding and contracting the chest. The second is longer and straight, to assist in the same office, and to sustain the stress which arises from the suspension of the trunk between the shoulders. The other ribs (*e*) have the arched form which we have described. The lower extremity of the rib is attached to or composed of cartilage, a yielding elastic substance, to enable the ribs to be more easily moved by the muscles of respiration, and to bring them back again to their natural situation and shape when the muscles cease to act. These cartilages are received into, and constitute joints with the *sternum* or breast-bone, formed almost in the shape of the prow of a ship (*c*), and with a projection of cartilage at each end. The projection before is evident to the eye in the living horse, and is called the point of the breast. This is occasionally injured by blows, or by the pressure of the collar, and first a tumour, and then an ulcer is formed which is very apt to become fistulous, and must be treated like poll-evil or fistulous withers.

The breast-bone is in the colt composed of six bones, which in the full-grown horse unite into one. Seven or eight of the ribs, the number occasionally varying, are attached to the sternum by very strong ligaments. These are called the *true* ribs, and they increase in length from the first to the seventh. The remaining ten or eleven are called *false* ribs;—they become gradually shorter, and narrower, and rounder; and their direction is more backward, in order to increase the cavity of the thorax and belly, and to strengthen the roof of the belly. Their cartilages are not attached to the breast-bone, but to each other, and yet connected with the breast-bone, and sharing in all its motions by means of the cartilage of the last true rib with which they all unite. In consequence of these shorter ribs, with long elastic cartilages, the bulk of the chest and of the belly is materially increased, and the ribs are much more easily moved.

Between the ribs, and mainly contributing to their motion, are two layers of muscles, *the intercostals* (between the ribs). According as the ribs are brought nearer to, or recede from each other, the cavity of the chest will be increased or diminished. These two layers are curiously contrived. If the fibres ran straight across from rib to rib, they would be exceedingly short; a short muscle could have but little contraction, and a very slight change of form or dimension could be produced. They run diagonally from rib to rib, and thus are more than double the length that they could otherwise have been; and so the degree of contraction is doubled, and the ribs are moved through a greater space. More perfectly to produce this effect, the muscular fibres of the outer layer run one way, and those of the inner layer a contrary, crossing each other in the form of an X. When these muscles contract, as they act from the fore ribs upon the hinder ones, although the ribs are brought nearer to each other, they are thrown outward, and the real effect is to expand, and not to contract the cavity of the chest. This is, perhaps, somewhat difficult to imagine, but it is the actual explanation of the matter. The ribs are drawn powerfully forward, and when drawn forward, they must be thrown outward, and the chest is necessarily expanded.

MUSCLES OF THE BREAST.

Of the proper form of the trunk we have already spoken. There are some important muscles attached to the breast, and therefore, every horse should have a breast tolerably expanded. In the cut, page 154, and in that at page 168, are seen a very important pair of muscles, the *pectorales transversi*, or pectoral muscles, forming two prominences in the front of the chest, and extending backward between the legs. They come from the fore and upper part of the breast-bone; go across the inward part of the arm, and reach from the elbow almost down to the knee. They confine the arm to the side in the rapid motion of the horse, and prevent him from being, what horsemen would call, and what is seen in a horse pushed beyond his natural power, "all abroad." Other muscles, *pectorales magni et parvi*, the great and little pectorals, rather above but behind these, go from the breast-bone to the arm, to draw back the point of the shoulder, and bring the shoulder upright. Another and smaller muscle goes from the breast-bone to the shoulder, to assist in the same office. A horse, therefore, thin and narrow in the breast, must be deficient in important muscular power.

Between the legs and along the breast-bone is the proper place in which to insert rowels, in cases of inflamed lungs.

CHEST-FOUNDER.

These muscles are occasionally the seat of a singular and somewhat mysterious disease. The old farriers used to call it *anticor* and *chest-founder*. The horse has considerable stiffness in moving, evidently not referable to the feet. There is tenderness about the muscles of the breast, and occasionally swelling, and after a while, the muscles of the chest waste considerably. We believe it to be nothing more than rheumatism, produced by suffering the horse to remain too long tied up, and exposed to the cold, or riding him against a very bleak wind. Sometimes a considerable degree of fever accompanies this; but bleeding, physic, a rowel in the chest, warm embrocations over the parts affected, warm stabling, and warm clothing, with doses of a drachm or two of antimonial powder, will soon subdue the complaint.

DROPSY OF THE SKIN OF THE CHEST.

Dropsical swellings often appear between the fore-legs, and on the chest. They are effusions of fluid underneath the skin. They accompany various diseases, particularly when the animal is weakened by them, and sometimes appear when there is no other disease than the debility, which, in the spring and fall of the year, accompanies the changing of the coat. The treatment will vary with the cause of the affection, or the accompanying disease. Small punctures with the lancet will seldom do harm;—friction of the part, if it can be borne, will be serviceable;—mild exercise should be used;—diuretics given, mixed with some cordial, with liberal food, as carrots, malt mashes, and occasionally a very mild dose of physic, and that followed by tonics and cordials, with diuretics. The vegetable tonics, as gentian and columbo with ginger, will be most effectual.

The cavity of the trunk consists of two compartments, divided from each other by the *diaphragm* or *midriff*. The first, into which we have traced the gullet and the wind-pipe, contains the heart and the lungs. It is lined by a delicate membrane called the *pleura* (the side, or membrane of the side), which likewise extends over and affords a covering to the lungs. A portion of it, dipping down from its attachment to the spine, separates the chest into two parts, each of which contains one of the lobes or divisions of the lungs; and this portion, the *mediastinum* (standing in the middle), forms a kind of bag enveloping the heart. The use of this membrane is to throw out a fluid to moisten the different surfaces, and prevent all dangerous friction or rubbing between these important parts; and also, to support these organs in their natural situation.

THE HEART.

The heart is placed between a doubling of the pleura, and is likewise surrounded by a membrane or bag of its own, called the *pericardium* (about the heart). This likewise throws out a fluid, for the purposes above-mentioned. When the pericardium or the heart itself becomes inflamed, this secretion is much increased; and so much fluid accumulates as to obstruct the beating of the heart. This disease is called *dropsy of the heart*. It is not easily distinguished from inflammation of the lungs; but this is a matter of little consequence, for the treatment would be nearly the same in both.

The heart is the engine by which the blood is circulated through the frame. It is composed of four cavities, two above called auricles, from their supposed resemblance to a dog's ear, and two ventricles or little bellies, occupying the substance of the heart. The blood which has circulated through the frame, and nourished it, returns to the heart through the veins. It enters the auricle on the right side, where it accumulates as in a reservoir, until there is enough to fill the ventricle below. The auricle then contracts, and throws the blood into the ventricle. That contracts in its turn, and drives the blood, not back again into the auricle, for there is as complete a valve as that in the sucker of a pump to prevent this, but through an aperture that leads to the lungs. The blood traverses, as we shall presently see, all the little vessels and cells of the lungs, and undergoes an important change there, and is carried to the left auricle; thence it descends to the left ventricle, and by the powerful closing of the ventricle, is propelled into the arteries. The first artery, the aorta, rises from the left ventricle, and the blood, by the force communicated to it, by the sudden contraction of the ventricle and assisted by the elastic power of the arteries which keeps them open and free from obstruction, and also by the pressure of the muscular and elastic coats, endeavouring to return to their former dimensions, pursues its course through every part of the frame.

The heart is subject to disease. It powerfully sympathises with the maladies of every part. An injury of the foot will speedily double the quickness of the beatings or pulsations of the heart. It sometimes is inflamed, without previous affection of any other part. This is not a frequent, but a most dangerous disease, and is characterised by a pulse quick and strong, and a bounding action of the heart that may occasionally be seen at the side, and even heard at the distance of several yards. There is also a peculiar alertness and quickness in every motion of the animal; and an energy of expression in the countenance exceedingly remarkable. Speedy and copious blood-letting will alone avail to save the horse; for the heart, over excited and called on to perform this double work, must soon be exhausted.

THE ARTERIES.

The vessels which carry the blood from the heart are called arteries (*keeping air*, the ancients thought that they contained air). They are composed of three coats; the outer or elastic is that by which they are enabled to yield to the gush of blood, and enlarge their dimensions as it is forced along them, and by which also they contract again as soon as the gush of blood has passed; the middle coat is the muscular, by which this contraction is more powerfully performed, and the blood urged on in its course; the inner or membranous coat is the mere lining of the tube.

This yielding of the artery to the gush of blood, forced into it by the contraction of the heart, constitutes

THE PULSE.

The pulse is a very useful assistant to the practitioner of human medicine, and much more so to the veterinary surgeon, whose patients cannot describe either the seat or degree of ailment or pain. The number of pulsations in any artery will give the number of the beatings of the heart, and so express the irritation of that organ, and of the frame generally. In a state of health, the heart beats in the farmer's horse about thirty-six times in a minute. In the smaller, and in the thorough-bred horse, the pulsations are 40 or 42. This is said to be the *standard* pulse,—the pulse of health. It varies singularly little in horses of the same size and breed, and where it is found there can be little materially wrong. The most convenient place to feel the pulse, is at the lower jaw, (p. 119) a little behind the spot where the submaxillary artery and vein, and the parotid duct, come from under the jaw. There the number of pulsations will be easily counted, and the character of the pulse, a matter of fully equal importance, will be clearly ascertained. Many horsemen put the hand to the side. They can certainly count the pulse there, but they can do nothing more. We must be able to press the artery against some hard body, as the jaw-bone, in order to ascertain the manner in which the blood flows through it, and the quantity that flows.

When the pulse reaches fifty or fifty-five, some degree of fever may be apprehended, and proper precaution should be taken. Seventy or seventy-five will indicate a somewhat dangerous state, and put the owner and the surgeon not a little on the alert. Few horses long survive a pulse of one hundred, for by this excessive action the energies of nature are speedily worn out.

Some things, however, should be taken into account in forming our conclusion from the frequency of the pulse. Exercise, a warm stable, fear, will wonderfully increase the number of pulsations.

When a careless, brutal fellow goes up to a horse, and speaks hastily to him, and handles him roughly, he adds ten beats per minute to the pulse; and will often be misled in the opinion he may form of the state of the animal. A judicious person will approach the patient gently, and pat and sooth him, and even then the circulation, probably, will be little disturbed; and he should take the additional precaution of noting the number and quality of the pulse, a second time, before he leaves the animal.

If a *quick* pulse indicate irritation and fever, a *slow* pulse will likewise characterise diseases of an opposite character. It accompanies the sleepy stage of staggers, and every malady connected with deficiency of nervous energy.

The heart may not only be excited to more frequent, but also to more violent action. It may contract more powerfully upon the blood, which will be driven with greater force through the arteries, and the expansion of the vessels will be greater and more sudden. Then we have the *hard* pulse,—the sure indicator of considerable fever, and calling for the immediate and free use of the lancet.

Sometimes the pulse may be hard and jerking, and yet *small.* The stream though forcible is not great. The heart is so irritable, that it contracts before the ventricle is properly filled. The practitioner knows that this shews a dangerous state of disease. It is an almost invariable accompaniment of inflammation of the bowels.

A *weak* pulse, when the arterial stream flows slowly, is caused by the feeble action of the heart. It is the reverse of fever, and expressive of debility.

The *oppressed* pulse is when the arteries seem to be fully distended with blood; there is obstruction somewhere, and the action of the heart can hardly force the stream along, or communicate pulsation to the current. This is the case in sudden inflammation of the lungs. They are overloaded and gorged with blood, which cannot find its way through their minute vessels. This accounts for the well-known fact of a copious bleeding increasing a pulse previously oppressed. A portion being removed from the distended and choked vessels, the remainder is able to flow on.

There are many other varieties of the pulse, which it would be tedious here to particularise, and we will conclude our remarks on it by observing, that, during the act of bleeding, its state should be carefully observed.

Many veterinary surgeons, and gentlemen too, are apt to order a certain quantity of blood to be taken away, but do not condescend to superintend the operation. This is unpardonable in the surgeon, and censurable in the owner of the horse. The horse is bled for some particular purpose. There is some state of disease, indicated by a peculiar quality of the pulse, which we are endeavouring to alter. The most experienced practitioner cannot tell what quantity of blood must be abstracted to produce the desired effect. The change of the pulse can alone indicate when the object is accomplished; therefore, the operator should have his finger on the artery during the act of bleeding, and, comparatively regardless of the quantity, continue to take blood, until, in inflammation of the lungs, the oppressed pulse becomes fuller and more distinct, or the strong pulse of considerable fever is evidently softer, or the animal exhibits symptoms of faintness.

The arteries divide as they proceed through the frame, and branch out into innumerable minute tubes, termed capillaries (hair-like tubes), and they even become so small as to elude the sight. The slightest puncture cannot be inflicted without wounding some of them.

In these little tubes, the nourishment of the body, and the separation of all the various secretions is performed, and, in consequence of this, the blood is changed; and when these capillaries unite together, and begin to enlarge, it is found to be no longer arterial, or of a florid red colour, but venous, or of a blacker hue. Therefore, the principal termination of the arteries is in veins. The point where the one ends, and the other commences, cannot be ascertained; it is when the red arterial blood, having discharged its function, is changed to venous or black blood; but this is a process gradually performed, and therefore the vessel is gradually changing its character.

Branches from the ganglial or sympathetic nerves wind round these vessels, and endue them with energy to discharge their functions. When the nerves communicate too much energy and these vessels consequently act with too much power, *inflammation* is produced. If this disturbed action be confined to a small space, or a single organ, it is said to be *local*, as inflammation of the eye, or of the lungs; when this inordinate action spreads from its original seat, and embraces the whole of the arterial system, *fever* is said to be present, and which usually increases in proportion as the local disturbance increases, and subsides with it.

INFLAMMATION.

Local inflammation is characterised by redness, swelling, heat, and pain. The redness proceeds from the increased quantity of blood flowing through the part, occasioned by the increased action of the vessels. The swelling arises from the same cause, and from the deposit of fluid in the neighbouring substance. The natural heat of the body is produced by the gradual change which takes place in the blood, in passing from an arterial to a venous state. If more blood be driven through the capillaries of an inflamed part, and in which this change is effected, more heat will necessarily be produced there; and the pain is easily accounted for, by the distention and pressure which must be produced, and the participation of the nerves in the disturbance of the surrounding parts.

We have spoken of some of these local inflammations, and shall speak of others when describing the structure of the parts that are occasionally attacked by them. The treatment will in some degree vary with the part attacked, and the degree of the inflammation; but it will necessarily include the following particulars.

If inflammation consist of increased flow of blood to and through the part, the ready way to abate the inflammation, is to lessen the quantity of blood. If we take away the fuel, the fire will go out. All other means are comparatively unimportant, compared with *bleeding*. Blood may be taken from the jugular, and so the general quantity may be lessened; but if it can be taken from the neighbourhood of the part, it will be productive of tenfold benefit. One quart of blood taken from the foot in acute founder, by unloading the vessels of the inflamed part, and enabling them to contract, and, in that contraction, to acquire tone and power to resist future distention, will do more good than five quarts taken from the general circulation. An ounce of blood obtained by scarifying the swelled vessels of the inflamed eye, will give as much relief as a copious bleeding from the jugular. It is a principle in the animal frame which should never be lost sight of by the veterinary surgeon, or the horseman, that if by bleeding the process of inflammation can once be checked,—if it can be suspended but for a little while,—although it may return, it never returns with the same degree of violence, and in many cases it is got rid of at once. Hence the necessity of bleeding early, and bleeding largely, in inflammation of the lungs, or of the bowels, or of the brain, or of any important organ. Many horses are lost for want of bleeding, or from insufficient bleeding, but we never knew one materially injured by the most copious abstraction of blood in the *early* stage of acute inflammation. The horse will bear, and with advantage, the loss of an almost incredible quantity of blood. Four quarts taken from him, will be comparatively little more than one pound taken from the human being. We can scarcely conceive a considerable inflammation of any part of the horse, either proceeding from sprains, contusions, or any other cause, in which bleeding, local (if possible) or general, or both, will not be of essential service.

Next in importance to bleeding is purging. Something may be removed from the bowels, the retention of which would increase the general irritation and fever;—the blood will be materially lessened, for the quantity of serous or watery fluid which is separated from it by a brisk purge, the action of which in the horse continues probably for more than twenty-four hours, is enormous; and while the blood is thus determined to the bowels, less even of that which remains will flow through the inflamed part. When the circulation is directed to one set of vessels, it is proportionably diminished in other parts. It was first directed to the inflamed parts, and they were overloaded and injured: it is now directed to the bowels, and the inflamed parts are relieved. While the purging continues, there is also some degree of languor and sickness felt, and the force of the circulation is thereby diminished, and the general excitement lessened. The farmer will, therefore, see the importance of physic in every case of considerable external inflammation. If the horse is laid by for a few days from injury of the foot, or sprain, or poll-evil, or wound, or almost any cause of inflammation, a physic ball should be given.

In cases of internal inflammation, much judgment is required to determine when a purgative may be beneficial or injurious. In inflammation of the lungs or bowels it should never be given. There is so strong a sympathy between the various contents of the cavity of the chest, that no one of them can be inflamed to any great extent, without all the others being disposed to become inflamed; and, therefore, a dose of physic in inflamed lungs would be frequently as fatal as a dose of poison. The excitement produced on the bowels by the purgative will soon run on to inflammation, which no medical skill can stop.

The means of abating external inflammation are various and seemingly contradictory. The heat of the part very naturally and properly led to the application of cold embrocations and lotions. Heat has a strong tendency to equalize itself, or to leave that substance which has a too great quantity of it, or little capacity to retain it, for another which has less of it, or more capacity to retain it. Hence the advantage of cold applications, by which a great deal of the unnatural heat is speedily taken away from the inflamed part. The foot labouring under inflammation is put into cold water; or the horse is made to stand in water or wet clay, and various cold applications are used to sprains. The part is wetted with diluted vinegar or goulard, or salt and water. We believe that when benefit is derived from these applications, it is to be attributed to their coldness alone, and that water, and when especially cooled below the natural temperature, is quite as good as anything else. An ounce of nitre dissolved in a pint of water, will lower the temperature of the fluid many degrees; but the lotion must be applied immediately after the salt has been dissolved; and it should be applied in such a way that the inflamed part may be fully exposed to the process of evaporation. While the fluid is converted into vapour, by the heat of the skin, a considerable degree of cold is produced. Let the limb or the part have the full benefit of this, by being uncovered. A bandage may be afterwards applied to strengthen the limb, but during the continuance of active inflammation it will only confine the heat of the part, or prevent the part from benefiting by the salutary influence of the cold produced by the evaporation of the water.

Sometimes, however, we resort to warm fomentations, and if benefit be derived from their use, it is to be traced to the warmth of the fluid, and not to any medicinal property in it; and warm water will do as much good to the horse who has so thick a skin, as a decoction of chamomile, or marshmallow, or even of poppy heads, or any nostrum that the farrier may recommend. Fomentations increase the warmth of the skin, and open the pores of it, and promote perspiration, and so lessen the tension and swelling of the part, assuage pain, and relieve inflammation. Fomentations, to be useful, should be long and frequently employed, and at as great a degree of heat as can be used without giving the animal pain. Poultices are nothing but more permanent, or longer-continued fomentations. The part is exposed to the influence of warmth and moisture for many hours or days without intermission, and perspiration being so long kept up, the distended vessels will be very materially relieved. The advantage derived from a poultice is attributed to the heat and moisture, which, by means of it, can be long applied to the skin, and it should be composed of materials which will best afford this heat and moisture. The bran poultice of the farrier will therefore be objectionable. It is never perfectly in contact with the surface of the skin, and it becomes nearly dry in a few hours, and then is injurious. Linseed-meal is a much better material for a poultice; it will remain moist for twenty-four hours. The poultice is easily made, by pouring hot water on the meal, a little at a time, and moulding it well with the hand until the cataplasm attains its proper consistence.

It is often very difficult to decide when a cold or a hot application is to be used, and no general rule can be laid down, except that in cases of superficial inflammation, and in the early stage, cold lotions will be preferable; but when the inflammation is deeper seated, or fully established, warm fomentations may be most serviceable.

Stimulating applications are frequently used in local inflammation. We have shewn the action of a blister in hastening the suppuration of the tumour of strangles. When the inflammation is deeply seated, a stimulating application to the skin will cause some irritation and inflammation there, and lessen or sometimes remove the original one; hence the use of rowels and blisters in inflammation of the chest. Inflammation to a high degree cannot exist in parts so near to each other. If we excite it in one, we shall abate it in the other, and also by the discharge which we establish from the one, we shall lessen the determination of blood to the other.

With one caution we will dismiss this part of our subject; stimulating and blistering applications should never be applied to a part already inflamed. We shall not put out a fire by heaping more fuel upon it. Hence the mischief which the farrier often does by rubbing his abominable oils on a recent sprain, hot and tender. Many a horse has been ruined by this absurd treatment. When the heat and tenderness have disappeared by the use of cold lotions or fomentations, and the leg or sprained part remains enlarged, or even bony matter threatens to be deposited, we may be justified in exciting inflammation of the skin by a blister, in order to rouse the deeper seated absorbents to action, and enable them to take up this deposit; but we would again state it as a principle that, except to hasten the natural process and effects of inflammation, a blister, or stimulating application, should, in the treatment of the horse, never be applied to a part already inflamed.

FEVER.

Fever is general increased arterial action, either without any local affection, or in consequence of the sympathy of the system with inflammation in some particular part.

The first is pure fever. Some have denied that it exists in the horse, but they must have been strangely careless observers of the diseases of that animal. The truth of the matter is, that the usual stable management and general treatment of the horse are so absurd, that various parts of him are rendered so liable to take on inflammation, that pure fever will exist but a very little time without degenerating into inflammation of these parts. The lungs are so weakened by the heated and foul air of the ill-ventilated stable, and by sudden changes from almost insufferable heat to intense cold; and the feet are so injured by hard usage and injudicious shoeing, that, sharing from the beginning in the general vascular excitement which characterises fever, they soon become excited far beyond other portions of the frame; and that which commenced as fever becomes inflammation of the lungs or feet. Pure fever, however, is sometimes seen, and runs its course as fever.

It begins frequently with a cold or shivering fit, although this is not essential to fever. The horse is dull, unwilling to move, with a staring coat, and cold legs and feet. This is succeeded by warmth of the body; unequal distribution of warmth to the legs; one hot, and the other three cold, or some unnaturally warm, and others unusually cold, although not the deathy coldness of inflammation of the lungs; the pulse quick, soft, and often indistinct; breathing somewhat laborious; but no cough, or pawing, or looking at the flanks. The animal will scarcely eat, and is very costive. While the state of pure fever lasts, the shivering fit returns at nearly the same hour every day, and is succeeded by the warm one, and that often by a very slight sweating one; and this goes on for several days until local inflammation appears, or the fever gradually subsides. No horse ever died of pure fever; if he is not destroyed by inflammation of the lungs, or feet, or bowels succeeding to the fever, he gradually recovers.

What we have said of the treatment of local inflammation will sufficiently indicate that which we should recommend in fever. Fever is general increased action of the heart and arteries, and therefore evidently appears the necessity for bleeding, regulating the quantity of blood taken by the degree of fever, and usually continuing to take it (the finger being kept on the artery) until some impression is made upon the system. The bowels should be gently opened; but the danger of inflammation of the lungs, and the uniformly injurious consequence of purgation in that disease, will prevent the administration of an active purgative. One drachm and a half of aloes may be given morning and night with the proper fever medicine, until the bowels are slightly relaxed, after which nothing more of an aperient quality should be administered. Digitalis, emetic tartar, and nitre should be given morning and night, in proportions regulated by the circumstances of the case, and these should give way to white hellebore in doses of half a drachm twice in the day if symptoms of inflammation of the lungs should appear. The horse should be warmly clothed, but be placed in a cool and well-ventilated stable.

Symptomatic fever is generally increased arterial action, proceeding from some local cause. No organ of consequence can be long disordered or inflamed without the neighbouring parts being disturbed, and the whole system gradually participating in the disturbance. Inflammation of the feet or of the lungs never existed long as to any material extent, without being accompanied by some degree of fever.

The treatment of symptomatic fever should resemble that of simple fever, except that particular attention should be paid to the state of the part originally diseased. If the inflammation which existed there can be subdued, the general disturbance will usually cease.

The arteries terminate occasionally in openings on different surfaces of the body. On the skin they pour out the perspiration, and on the different cavities of the frame they yield the moisture which prevents friction. In other parts they terminate in glands, in which a fluid essentially different from the blood is secreted or separated from it: such are the parotid and salivary glands, the kidneys, the spleen, and the various organs or laboratories which provide so many and such different secretions, for the multifarious purposes of life; but the usual termination of arteries is in veins.

THE VEINS.

These vessels carry back to the heart the blood which had been conveyed to the different parts by the arteries. They have but two coats, a muscular and a membranous; both of them are thin and comparatively weak. They are more numerous and much larger than the arteries, and consequently the blood, lessened in quantity by the various secretions separated from it, flows more slowly through them. It is forced on partly by the first impulse communicated to it by the heart; partly, in the extremities and external portions of the frame, by the pressure of the muscles; and in the cavity of the chest, its motion is assisted or principally caused by the sudden opening of the ventricles of the heart, after they have closed upon and driven out their contents, and thereby causing a vacuum which the blood rushes on to fill. There are curious valves in the veins which prevent the blood from flowing backward.

BOG AND BLOOD SPAVIN.

The veins of the horse, although their coats are thin compared with those of the arteries, are not subject to the enlargements (varicose veins) which are so frequent, and often so painful, in the legs of the human being. The legs of the horse may exhibit many of the injurious consequences of hard work, but the veins will, with one exception, be unaltered in structure. Attached to the extremities of most of the tendons, and between the tendons and other parts, are little bags containing a mucous substance to enable the tendons to slide over each other without friction, and to move easily on the neighbouring parts. From violent exercise these little bags are liable to enlarge. Windgalls and thoroughpins are instances of this. There is one of them on the inside of the hock at its bending: this sometimes becomes considerably increased in size, and the enlargement is called a *bog spavin.* A vein passes over this bag, which is pressed between the enlargement and the skin, and the passage of the blood through it is impeded; the vein is consequently distended by the accumulated blood, and the distension reaches from this bag as low down as the next valve. This is called a *blood-spavin.* Blood-spavin then is the consequence of bog-spavin. It very rarely occurs, and is, in the majority of instances, confounded with bog-spavin.

Blood-spavin does not always cause lameness, except the horse is very hard worked, and then it is doubtful whether the lameness should not be attributed to the enlarged mucous bag rather than to the distended vein. Both of these diseases, however, render a horse unsound, and materially lessen his value.

Old farriers used to tie the vein, and so cut off altogether the flow of the blood. Some of them, a little more rational, used to dissect out the bag which caused the distension of the vein: but the modern and more prudent way is to endeavour to promote the absorption of the contents of the bag. This may be attempted by pressure long applied. A bandage may be contrived to take in the whole of the hock except its point; and a compress made of folded linen being placed on the bog-spavin, may confine the principal pressure to that part. It is, however, very difficult to adapt a bandage to a joint which admits of such extensive motion; therefore most practitioners apply two or three successive blisters over the enlargement, when it usually disappears; but unfortunately it returns again if any extraordinary exertion is required from the horse.

Of the wounds of veins, and their consequent inflammation, we have spoken when describing the veins of the neck. The veins are selected in preference to the arteries for the purpose of bleeding, because they are more superficial and larger, and blood can be more easily and certainly procured from them, and the flow of the blood can be more easily stopped.

BLEEDING.

This operation is performed with a fleam or a lancet. The first is the common instrument, and the safest, except in skilful hands. The lancet, however, has a more surgical appearance, and will be adopted by the veterinary practitioner. A bloodstick, a piece of hard wood loaded at one end with lead, is used to strike the fleam into the vein. This is sometimes done with too great violence, and the opposite side of the coat of the vein is wounded. Bad cases of inflammation have resulted from this. If the fist be doubled, and the fleam is sharp and is struck with sufficient force with the lower part of the hand, the bloodstick may be dispensed with.

For general bleeding the jugular vein is selected. The horse is blindfolded on the side on which he is to be bled, or his head turned well away; the hair is smoothed along the course of the vein with the moistened finger; then with the third and little fingers of the left hand, which holds the fleam, pressure is made on the vein sufficient to bring it fairly into view, but not to swell it too much, for then, presenting a rounded surface, it would be apt to roll or slip under the blow. The point to be selected is about two inches below the union of the two portions of the jugular at the angle of the jaw (see cut, p. 119). The fleam is to be placed in a direct line with the course of the vein, and over the precise centre of the vein, as close to it as possible, but its point not absolutely touching the vein. A sharp rap with the bloodstick or the hand on that part of the back of the fleam immediately over the blade, will cut through the vein, and the blood will flow. A fleam with a large blade should always be preferred, for the operation will be materially shortened, which will be a matter of some consequence with a fidgety or restive horse; and a quantity of blood drawn speedily will have far more effect on the system than double the weight slowly taken; while the wound will heal just as readily as if made by a smaller instrument. There is no occasion to press so hard against the neck with the pail, or can, as some do; a slight pressure, if the incision has been large enough, and straight, and in the middle of the vein, will cause the blood to flow sufficiently fast; or the finger being introduced into the mouth between the tushes and the grinders, and gently moved about, will keep the mouth in motion, and hasten the rapidity of the stream by the action and pressure of the neighbouring muscles.

When sufficient blood has been taken, the edges of the wound should be brought closely and exactly together, and kept together by a small, sharp pin being passed through them. Round this a little tow, or a few hairs from the mane of the horse, should be wrapped, so as to cover the whole of the incision; and the head of the horse should be tied up for several hours to prevent his rubbing the part against the manger. In bringing the edges of the wound together, and introducing the pin, care should be taken not to draw the skin too much from the neck, otherwise blood will insinuate itself between the skin and the muscles beneath, and cause an unsightly and sometimes troublesome swelling.

The blood should be received into a vessel the dimensions of which are exactly known, so that the operator may be able to calculate at every period of the bleeding the quantity that is subtracted. Care likewise should be taken that the blood flow in a regular stream into the centre of the vessel, for if it be suffered to trickle down the sides, it will not afterwards undergo those changes by which we partially judge of the extent of inflammation. The pulse, however, and the symptoms of the case collectively, will form a better criterion than any change in the blood. Twenty-four hours after the operation, the edges of the wound will have united, and the pin should be withdrawn. When the bleeding is to be repeated, if more than three or four hours have elapsed, it will be more prudent to make a fresh incision rather than to open the old wound.

Few directions are necessary for the use of the lancet. They who are competent to operate with it, will scarcely require any. If the point be sufficiently sharp the lancet can scarcely be too broad shouldered; and an abscess lancet will generally make a freer incision than that in common use. A spring lancet has lately been invented by Mr. Weiss in the Strand, by which any one may bleed from the jugular, or from a smaller vein safely and certainly. Whatever instrument be adopted, too much care cannot be taken to have it perfectly clean, and very sharp. It should always be most carefully wiped and dried immediately after the operation, otherwise in a very short time the edges will begin to be corroded.

For general bleeding the jugular vein is selected as the largest superficial vein, and most easily got at. In every affection of the head, and in cases of fever or extended inflammatory action, it is decidedly the best place for bleeding. In local inflammation blood may be taken from any of the superficial veins. In supposed affections of the shoulder, or of the fore-leg or foot, the *plate* vein, which comes from the inside of the arm, and runs upwards directly in front of it towards the jugular, may be opened. In affections of the hinder extremity, blood is sometimes abstracted from the *saphœna*, or thigh vein, which runs across the inside of the thigh. In foot cases it may be taken from the coronet, or, much more safely, from the toe; not by cutting out, as the farrier does, a piece of the sole at the toe of the frog, which sometimes causes a wound difficult to heal, and followed by festering, and even by canker; but cutting down with a fine drawing-knife called a searcher, at the union between the crust and the sole at the very toe until the blood flows, and, if necessary, encouraging its discharge by dipping the foot in warm water. The mesh-work of both arteries and veins will be here divided, and blood is generally obtained in any quantity that may be needed. The bleeding may be stopped with the greatest ease, by placing a bit of tow in the little groove that has been cut, and tacking the shoe over it.

THE LUNGS.

The chest, likewise, contains the lungs, most important from the office which they discharge, and the diseases to which they are liable. There are two lungs, the right and the left, separated from each other by the mediastinum. The right lung is larger than the left, because the heart, inclining to the left, leaves less room on that side of the chest. Each of the lungs is likewise partially divided into lobes; the right lung contains three, and the left two. When the windpipe enters the chest, it divides into two parts, one going to each lung; and when these reach the substance of the lungs, they separate into innumerable branches, each terminating in a little bag or cell. These branches, with the cells attached to them, bear no slight resemblance to bunches of minute grapes. Around these cells spread countless blood-vessels, being the extreme ramifications of those which conveyed the blood from the right side of the heart to the lungs, and the commencement of those which carry it back from the lungs to the left side of the heart; and the cells and the blood-vessels are connected together by an intervening substance of a fibrous and cellular texture.

The office of the lungs may be very shortly stated. The blood passing through the capillaries of the body, and contributing to the nourishment of the frame, and furnishing all the secretions, becomes, as we have described, changed. It is no longer able to support life: it is possessed of a poisonous principle, and that principle is a superabundance of a substance called *carbon*, which must be got rid of before the blood can again be usefully employed. There is an ingredient in the atmospheric air called *oxygen*, which has a strong attraction for this carbon, and which will unite with it wherever it finds it. The chest enlarges by the action of the diaphragm, and the intercostal and other muscles, as we have narrated; and the lungs expanding with the chest, in order to fill up the vacuum which would otherwise exist between them and the sides of the chest, these cells enlarge, and a kind of vacuum is formed in each of them, and the air rushes down and fills them, and being divided from the venous and poisoned blood by these membranes alone, it is enabled to act upon the blood, and attracts from it this carbon, and thus purifies it, and renders it arterial blood, and fit for the purposes of life. This being accomplished, the chest contracts, and the lungs are pressed into smaller compass, and a portion of the air, impregnated with the carbon, and rendered poisonous in its turn, is squeezed out. Presently the chest expands again, and the lungs expand with it, and fresh pure air is admitted, which is shortly pressed out again, empoisoned by the carbon of the blood; and these alternate expansions and contractions constitute the act of breathing.

When the animal powerfully exerts himself, a more ample supply of pure blood is required to sustain the energies of life, and the action of the muscles forces the blood more rapidly through the veins; hence the quick and deep breathing of a horse at speed; hence the necessity of a capacious chest, in order to yield an adequate supply, and the connexion of this capacity of the chest with the speed and the endurance of the horse; hence the wonderful relief which the mere loosening of the girths affords to a horse blown and distressed, enabling the chest to expand and to contract to a greater extent, in order to yield more purified blood; and hence the relief afforded by even a short period of rest, during which this expenditure is not required, and the almost exhausted energies of these organs have time to recover. Hence, likewise, appears the necessity of an ample chest for the accumulation of much flesh and fat; for, if a considerable portion of the blood be employed in the growth of the animal, and it be thus rapidly changed, there must be provision for its rapid purification, and that can only be effected by the increased bulk of the lungs, and the corresponding largeness of the chest to contain them.

The diseases of these organs are among the most serious to which the horse is exposed, and interfere most with his usefulness. A glandered horse may be, and often is too long employed in our service; a blind horse, under the guidance of the driver, may employ both his strength and his speed for our benefit; but a horse with diseased lungs is worth nothing at all, and hence some of the difficulties with which the veterinary practitioner has to struggle. A surgeon who practises on the human body will obtain the gratitude of his patient, if he so far removes a severe affection as to enable him to live on with a certain degree of comfort, although his activity and his power of exertion may be considerably impaired; but the veterinary surgeon is thought to have done nothing, unless he renders the animal perfectly sound—unless, in fact, he does that which it is absolutely impossible to accomplish.

INFLAMMATION OF THE LUNGS.

There is no animal among all those whom we have subdued that, previous to his breaking in, is so free from disease as the horse; there is no animal which, after he has been enlisted in our service, is so liable to disease, and especially of the lungs. How do we account for this? Few things can be more injurious to the delicate membrane that lines the cells of the lungs, than the sudden change from heat to cold, to which, under the usual stable management, the horse is subject. In the spring and autumn, the temperature or heat of most stables is several degrees higher than that of the open air; in winter it is frequently more than thirty degrees. The necessary effect of this must be to weaken and exhaust the energies of the parts most exposed to the influence of these changes, and they are the lungs. It is, however, not only heated but empoisoned air that the horse respires;—composed of his own contaminated breath, and of vapours from his dung, and particularly from his urine, strongly impregnated with hartshorn, painful to the eyes and irritating to the chest.

There is likewise an intimate connexion between the lungs and the functions of the skin. When the insensible perspiration is suddenly stopped, cold and cough are the first consequences. What must inevitably happen to the horse that stands, twenty hours out of the four and twenty, in a heated atmosphere, and stands there warmly clothed, and every pore of his skin opened, and the insensible perspiration, and the sensible too, profusely pouring out, and then, with his coat stripped from his back, is turned shivering into a nipping winter's air? The discharge from the skin is at once arrested, and the revulsion, or pernicious effect of the sudden stoppage of a natural evacuation, falls on the lungs, too much weakened, and disposed to inflammation by heated air and poisonous fumes.

These simple observations are pregnant with interest and instruction to all connected with horses. He who would have his stud free from disease, and especially disease of the lungs, must pursue two objects, coolness and cleanliness. In the gentleman's stable, the first of these is studiously avoided, from the prejudice or the idleness of the groom, and from these stables proceed most of the cases of inflamed lungs; especially when this heat is combined with that temporary but mischievous nuisance, the repeated breathing of the same air during the night, and that air more vitiated by the fumes of the dung and urine. In the stables of the post-master, where not only closeness and heat, but the filth that would not be endured in a gentleman's establishment, are found, both inflammation of the lungs and glanders prevail; and in the stables of many agriculturists, cool enough from the poverty or the carelessness of the owner, but choked with filth, inflammation of the lungs is seldom seen, but mange, glanders, and farcy abound.

Inflammation of the substance of the lungs is sometimes sudden in its attack, but generally preceded by symptoms of fever. The pulse is occasionally not much increased in frequency, but oppressed and indistinct; the artery is plainly to be felt under the finger, and of its usual size, but the pulse no longer indicates the expansion of the vessel, as it yields to the gush of blood, and its contraction when the blood has passed; it is rather a vibration or thrill, communicated to a fluid already over-distending the artery; in a few cases, even this almost eludes the most delicate touch, and scarcely any pulsation is to be detected. The extremities are cold;—the nostril is expanded;—the head thrust out, and the flanks begin to heave. There is a peculiarity in the working of the flank. It is not the deep laborious breathing of fever, nor the irregular beating of broken wind, in which the air appears to be drawn in by one effort, while two seem to be necessary to expel it; but it is a quick hurried motion, evidently expressive of pain, and of inability to complete the action, on account of the pain, or of some mechanical obstruction. The membrane of the nose is of an intensely florid red—more vivid in the inside corners of the nostrils, and remaining concentrated there if at times it should seem to fade away higher up. The countenance is singularly anxious, and indicative of suffering, and many a mournful look is directed at the flanks. The horse stands in a singular manner, stiff, with his forelegs abroad, that the chest may be expanded as much as possible, and he is unwilling to move, lest for a moment he should lose the assistance of the muscles of the arms and shoulders, in producing that expansion; and, for the same reason, he obstinately stands up day after day, and night after night; or if he lies down from absolute fatigue, it is but for a moment.

In many instances, however, the approach of the disease is very treacherous, and the most careful practitioner may be deceived. The groom may perceive that the horse is somewhat off his feed, and dull, but he pays little attention to it; or if it arrests his notice, he only finds that the coat stares a little, that the legs are colder than usual, and the breathing in a slight degree quickened and shortened. In other cases, the symptoms are those of common fever, catarrh, or distemper; and the characteristics of true inflammation of the lungs appear late and unexpectedly. The cold leg and ear, the quickened, not deepened inspiration, the disinclination to lie down, and the anxious countenance, will always alarm the experienced observer.

Whatever may be the state of the pulse at first, it soon becomes oppressed, irregular, indistinct, and at length almost imperceptible. The heart is labouring in vain to push on the column of blood with which the vessels are distended, and the flow of which is obstructed by the clogged-up passages of the lungs. The legs and ears, which were cold before, become more intensely so—it is a clayey, deathy coldness. The mouth soon participates in it, and the breath too. The bright red of the nostril fades away, or darkens to a livid purple. The animal grinds his teeth. He still persists in standing, although he often staggers and almost falls; at length he drops, and after a few struggles dies.

The duration of the disease is singularly uncertain. It will occasionally destroy in less than twenty-four hours, and then the lungs present one confused and disorganised mass of blackness, and would lead the inexperienced person to imagine that long inflammation had gradually so completely broken down the substance of the lungs. Such a horse is said to die rotten, and many attempts have been made to prove that he must have been unsound for a great while, and probably before he came into his last owner's possession, and some expensive law-suits have been instituted on this ground. Let our readers, however, be assured, that this black, decomposed appearance of the lungs proves no disease of long standing, but inflammation intense in its nature, and that has very speedily run its course. The horse has died from suffocation, every portion of the lungs being choked up with this black blood, which has even broken into and filled all the air-cells by means of which it should have been purified.

More frequently the disease lasts a little longer. The lungs are sufficiently pervious for some blood to be transmitted; but the inflammation is too great to be subdued, or proper means have not been taken to subdue it; and it runs its usual course, and proceeds to actual mortification, and the lungs are found not only black, but putrid. This, too, would prove recent and violent inflammation, and not any old and unsuspected disease. This termination would be indicated, a day or two before the death of the animal, by the stinking breath, and the offensive discharge from the nose.

A frequent, and to the practitioner and the owner a most annoying termination of inflammation of the lungs, is dropsy in the chest. The disease seems to be subdued; the horse is more lively; his appetite returns; his legs and ears become warm; and those about him are deceived into the belief that he is doing well: nay, the most skilful surgeon is sometimes deceived. The anxiety to save his patient makes him hope the best, although the coat continues unhealthy, there is a yellow discharge from the nostril, the pulse is irregular, and the horse is frightened if suddenly moved, and especially if his head be considerably raised in the act of drenching, and he rarely or never lies down. Many days or some weeks will pass on, with these contradictory and unsatisfactory appearances; and a judgment of the result can only be formed by balancing them against each other. At length the patient shivers, the old symptoms return, and he very soon dies. On opening him, both sides of the chest are found nearly filled with fluid, impeding the pulsation of the heart, and the expansion of the lungs, and destroying the horse by suffocation.

Although the life of the horse may be saved, the consequences of inflammation of the lungs may often materially lessen, or even destroy the usefulness of the animal. As in many external inflammations considerable thickening of the part long remains, so a deposit of the coagulable portion of the blood may be left in the substance of the lungs, occupying the place of many of the air-cells, and preventing the contraction and closing of others. This produces the peculiarity of breathing, almost incompatible with speed or continuance, called *thick wind;* and frequently precedes *broken wind,* when, from the violent action of the lungs, and that action thus impeded by the obstruction we have described, some of the air-cells become ruptured. Too frequently, considerable irritability remains in the membrane lining the air-cells, and in other portions of the air-passages, and a cough is established, which, from its continuance, and the difficulty of its removal, is called *chronic cough.* We have already considered inflammation of the lungs, as one of the causes of *roaring.*

The treatment of inflammation of the lungs must evidently be of the most decisive kind. We have to struggle with a disease intense in its character, and we must attempt radically to cure, and not merely to palliate it. We must look to the future usefulness of the horse, and not to the possibility of his being enabled to drag on an existence almost uncomfortable to himself. Supposing the attack to have just commenced, the horse should be bled, not only until the pulse begins to rise, but until it afterwards begins to flutter or to stop, or the animal is evidently faint. The effect of the bleeding, and not the quantity of the blood taken, should be regarded; for the inflammation being subdued, the lost blood will soon be supplied again. This is one of the cases in which it is absolutely necessary that the surgeon, or the owner, should stand by with his finger on the pulse, and mark the effect that is produced. If, six hours afterwards, the horse continues to stand stiff, and heaves as quickly and as laboriously as before, and the legs are as intensely cold, and the membrane of the nose as red, the bleeding should be repeated, until the same effect again follows. In the majority of cases the inflammation will be now subdued. A third bleeding may, however, sometimes be necessary, but must not be carried to the same extent, for it is possible, by too great evacuation of blood, to subdue not merely the disease, but the powers of nature. If, after this, the legs become cold, and the heaving returns, and the membrane of the nose reddens, and the horse persists in standing, bleedings to the extent of two or three quarts will be advisable, to prevent the re-establishment of the disease. In all these bleedings, let not the necessity of a broad shouldered fleam or lancet, and a full stream of blood be forgotten. These are circumstances of far more importance than is generally imagined. The appearance of the blood will be some guide in our treatment of the case. The thickness of the adhesive buffy, yellow-coloured coat, which in a few hours will appear on it, will mark with some degree of accuracy the extent of the inflammation; but let it be remembered, that only which existed at the time of the bleeding. Not regardless of the appearance of the blood, but not putting too much faith in it, we must look to the horse to determine how far that inflammation may have been diminished, or a repetition of the bleeding be necessary.

When the bleeding has evidently taken effect, we must consider by what means we may further abate, or prevent the return of the inflammation. We should blister the whole of the brisket, and the sides, as high up as the elbows. *Blisters* are far preferable to *rowels.* They act on a more extensive surface; they produce a great deal more inflammation; and they are speedier in their action.

To ensure the full operation of the blister, the hair must be closely shaved, and an ointment composed of one part of powdered Spanish flies, and four of lard and one of resin, well rubbed in. The lard and the resin should be melted together, and the powdered flies afterwards added.

To form a rowel, the skin is raised between the finger and thumb, and, with a lancet, or with scissars contrived for the purpose, a slit is cut an inch in length. The finger, or the handle of the improved rowelling scissors, which are to be procured from Mr. Long, in Holborn, or from any veterinary instrument maker, is introduced, and the skin is forcibly separated from the muscular or cellular substance beneath, until there is a circular cavity two or three inches wide. Into this a piece of tow is inserted, sufficient to fill it, and previously smeared with blister ointment. This causes considerable inflammation and discharge. If a little of the tow be left sticking out of the incision, the discharge will conveniently dribble down it. The tow should be changed every day, with or without the ointment, according to the action of the rowel, or the urgency of the case. The large piece of stiff leather, with a hole in its centre, used by the farrier, is objectionable, as not being easily changed, and frequently, in the extraction of it, tearing the skin so as to cause a lasting blemish.

The blister sometimes will not rise. It will not when the inflammation of the chest is at its greatest intensity: too much action is going on there, for any to be excited elsewhere. The blister occasionally will not act in the later stages of the disease, because the powers of nature are exhausted. It is always a most unfavourable symptom when the blisters or the rowels do not take effect. The best time for the application of the blister, is when the inflammation is somewhat subdued by the bleeding; and then by the irritation which it excites, and in a part so near the original seat of disease, the inflammation of the chest is either abated or transferred to the skin; for, as we have before observed, it is an important law of nature, that no two violent actions of different kinds can take place in the frame at the same time.

Next comes the aid of medicine. If the patient was a human being the surgeon would immediately purge him. We must not do this: for from sympathy between the bowels and the lungs in the horse, we should either produce a fatal extension of inflammation, or a transferring of it in a more violent form, and the horse would assuredly die. We must back-rake, administer clysters, or perhaps give eight ounces of Epsom salts, dissolved in warm gruel. No castor-oil must be given. It may be a mild and a safe aperient for the human being: it is a very dangerous one for the horse.

Having a little relaxed the bowels, we eagerly turn to cooling or sedative medicines. The farrier gives his cordial to support the animal, and prevent rottenness. He adds fuel to the fire, and no wonder that the edifice is frequently destroyed. Nitre, digitalis, and emetic tartar, should be given in the doses already recommended, and persisted in until an intermittent state of the pulse is produced. Many practitioners give hellebore in doses of half a drachm, or two scruples, every six or eight hours, and they say with considerable advantage. It is continued until the horse hangs his head, and saliva drivels from his mouth, and he becomes half stupid, and half delirious. These symptoms pass over in a few hours, and the inflammation of the chest is found to be abated. If it be so, it is on the principle of the blister: the determination of blood to the head, and the temporary excitement of the brain or its membranes, divert the inflammation or a portion of it, from its original seat, and give time for the parts somewhat to recover their tone. We confess that we prefer the digitalis, emetic tartar, and nitre: they considerably lower the pulse, and they are safe.

It is of importance that we determine the blood, or a portion of it, from the inflamed and over-distended part to some other region. On this principle we warmly clothe the horse labouring under this disease, that we may cause the blood to circulate freely through the vessels of the skin, and that we may keep up the insensible perspiration, and perhaps produce some sweating. But do we put the horse in a warm place? No; for then we should bring the heated and poisoned air in contact with the inflamed lungs, and increase the excitement, already too great. It is an absurd practice to shut up every door and window, and exclude, if possible, every breath of air;—rather let every door and window be thrown open, and let pure and cold air find access to these heated parts. It is interesting to see how eagerly the horse avails himself of the relief which this affords him. If no direct draft blows upon him, he can scarcely be placed in too cool a box.

Now and then the whole skin of the horse may be rubbed with the brush, if it does not teaze and hurry him; but it is indispensable that the legs should be frequently and well hand-rubbed to restore the circulation in them, and they should be covered with thick flannel bandages. As to food, we do not want him to take any at first, and most certainly the horse should not be coaxed to eat. A very small quantity of hay may be given to amuse him, or a *cold* mash, or green meat, but not a particle of corn.

In eight-and-forty hours the fate of the patient will generally be decided. If there be no remission of symptoms, the inflammation will run on to congestion of the lungs, and consequent suffocation, or to gangrene. We must, in this case, give the medicines more frequently; repeat the blister; bleed, if the state of the animal will bear it; and rub the legs or even scald them. If the strength now rapidly declines, the horse may be drenched with gruel, and tonic medicine may be tried, as chamomile at first, and, this not recalling or increasing the fever, a little ginger and gentian may be added.

Should the heaving gradually subside, and the legs get warm, and the horse lie down, and the inflammation be apparently subsiding, let not the owner or the practitioner be in too great haste to get the animal well. Nature will slowly, but surely and safely, restore the appetite and strength; and it is very easy to bring back the malady in all its violence by attempting to hurry her. The food should be the same, cold mashes, green meat, or a little hay, if green meat cannot be procured, and thin gruel drunk from the pail—not given as a drench. Should the horse be very weak, or scarcely eat, tonics may be tried. The way should be felt very cautiously with the chamomile, and the sedative medicine again be immediately resorted to if there be the slightest return of fever. To the chamomile, the gentian and ginger may be gradually added, but no mineral tonic. After a while, hay may be offered, and a little corn, and the horse be suffered very gradually to return to his former habits.

The causes of inflammation of the lungs are changes from cold to heat, or heat to cold; exposure to cold while the horse is hot; washing with cold water immediately after exercise; sudden exposure to cold, after coming from a very hot stable; frequent checks while hunting; travelling in the face of a cold wind; the transference of general fever to the lungs previously disposed to inflammation from the usual stable management; and neglected catarrh, or catarrh treated with stimulants instead of cooling medicines. Any change from heat to cold, or from cold to heat, will produce it with almost equal certainty; the removal from a warm stable to a cold one, or from a cold one to a warmer; from grass to the stable, and from the stable to grass will equally give rise to disease of the lungs. It is generally the effect of our erroneous system of management.

We shall presently state the symptoms by which inflammation of the lungs may be distinguished from catarrhal fever. It may be distinguished from inflammation of the bowels by the pulse, which, in the latter disease, is small and wiry;—by the membrane of the nose, which is not then so much reddened;—by the indications of pain, as kicking at the belly, stamping, and rolling; by his eager scraping of the litter, and by the belly being painful to the touch, and also hot, when the bowels are inflamed.

PLEURISY.

Hitherto we have spoken of inflammation of the substance of the lungs; but inflammation may attack the membrane covering them and lining the side of the chest (*the pleura*), and be principally or entirely confined to that membrane. This is termed PLEURISY. The causes are the same as in inflammation of the substance of the lungs, and the symptoms are not very dissimilar. The guiding distinction will be the pulse. As the blood in this disease still traverses the lungs without obstruction, we have not the oppressed pulse, but rather the hard, full pulse characteristic of inflammation; the extremities are cold, but not so cold; the membrane of the nose intensely red in the former disease, because it is a continuation of the inflamed lining of the air cells of the lungs, is here but little reddened, because there is no connexion between them; if the sides are pressed upon in pleurisy pain will be felt, which the horse will express by a kind of grunt, and which is easily explained by the pressure being applied so close to the seat of disease. The manner of standing, however, will remain the same, and the obstinacy of standing the same, and the extension of the neck, and the protrusion of the nostril. After death the pleura of the ribs and the lungs will exhibit stripes or patches of inflammation, and the chest will be generally filled with serous fluid.

Copious bleeding is indicated here, as in inflammation of the substance of the lungs. Blisters and sedative medicines must likewise be resorted to. The only important difference is, that aperients may be administered with more safety than in the former disease. Puncturing of the chest to give escape to the fluid that is thrown out in it may be attempted. It cannot do harm, but it has very seldom saved or much prolonged the life of the animal. If the operation be attempted, it should be as soon as the presence of the fluid is suspected, and the means by which this may be ascertained we have already described. The opening should be effected with the common trochar used for tapping in dropsy in the human being, and should be made between the eighth and ninth ribs, and close to the cartilages. Diuretic medicines combined with tonics should be administered.

CATARRH, OR COMMON COLD.

This is a complaint of frequent occurrence, generally subdued without much difficulty, but often becoming of serious consequence if neglected. It is accompanied by a little increase of pulse; a slight discharge from the nose and eyes; a coat somewhat roughened; a diminution of appetite, and cough sometimes painful and frequent. A little warmth, a few mashes, and some doses of the medicine recommended under inflammation of the lungs, will speedily effect a cure. Should the cough be very painful and obstinate, it may be necessary to bleed; but then the disease is degenerating into bronchitis or catarrhal fever.

The divisions of the windpipe just before it enters the lungs, and the numerous vessels into which it immediately afterwards branches out, are called the *bronchial tubes,* and inflammation of the membrane that lines them is termed

BRONCHITIS.

It is catarrh extending to the entrance of the lungs. It is characterised by quicker and harder breathing than catarrh usually presents, and by a peculiar wheezing, which is relieved by the coughing up of mucus.

It is to be treated by bleeding, far less copious than in inflammation of the lungs, or even in catarrh. The horse will bear to lose only a very small quantity of blood when labouring under inflammation of the bronchial passages. The chest should be blistered, and digitalis given, and the other treatment similar to that for inflamed lungs, with the exception of the bleeding. Thick wind is a frequent consequence of neglected bronchitis.

CATARRHAL FEVER.

This malady has various names among horsemen, as *epidemic catarrh, influenza, distemper.* By the latter name it is generally distinguished in racing stables. It usually commences, like inflammation of the lungs and fever, with a shivering fit; to which rapidly succeed a hot mouth, greater heat of the skin than is natural, heaving of the flanks, and cough. The eyes are red and heavy, and the membrane of the nose red, but considerably paler than that of inflammation of the lungs, and even occasionally bordering on a livid hue. From the very commencement of the disease there is some discharge from the nose; at first of a mere watery nature, but soon thickening, and containing flakes, some of which stick to the membrane of the nose, and have been mistaken for ulcers. This discharge, at no great distance of time, becomes mattery and offensive. The glands likewise of the throat and under-jaw become enlarged, and the membranes of the nostril and the throat are inflamed and tender, and therefore the food is "quidded," and there is difficulty even in swallowing water, particularly if it be cold. The horse sips and slavers in the pail, and repeatedly coughs as he drinks. The cough is sometimes frequent and painful; so much so, that the horse repeatedly stamps with his feet, and shows signs of impatience and suffering in the act of coughing. To these symptoms rapidly succeeds very great weakness. The horse staggers, and sometimes almost falls as he moves about his box; or he supports himself by leaning his sides or his quarters against the box. To the inexperienced observer this early and excessive weakness will be very alarming, and he will give up the horse as lost. The legs generally swell, and enlargements appear on the chest and belly. These, however, are generally favourable. The pulse is quickened. It rises to sixty or seventy, but the number of its beatings, and the character of the pulse, which is seldom very hard, depend much on the degree of fever which accompanies the disease.

After a few days the cough becomes less frequent and painful; the glands of the throat diminished; the horse begins to eat a little green meat, and is more cheerful. In some cases, however, the membrane of the nose reddens, or streaks of red run through the lividness; and the legs become cold, and the countenance haggard, and inflammation of the lungs is at hand. At other times the breath is offensive; the discharge from the nose bloody; the evacuations loose, and slimy, and bloody; and the animal is speedily destroyed. The cause of this disease is obscure. It may be the consequence of common cold; or it will more frequently depend on some unexplained influence of the atmosphere. About the middle of spring and the commencement of autumn it is most frequent. Many horses in the same district, or in almost every part of the country, will be attacked by it. If the spring or autumn be wet and variable, almost every cold will degenerate into it; and there are too many circumstances which lead us to conclude that it is infectious. A lot of horses was bought at one of the fairs. They were all but one sent immediately to the residence of the purchaser at a considerable distance. The remaining one was employed for some purpose, and afterwards sent on a journey. He was seized with distemper, and on recovering sufficiently to travel, he was taken home. Three months had now elapsed since the purchase, and the other horses had been perfectly healthy; but in less than a fortnight after this horse arrived, they all sickened with distemper.

The treatment of catarrhal fever requires much judgment. It is clearly febrile in its commencement; but it speedily assumes the character of weakness. We will suppose that the disease is discovered at its very commencement. Bleeding will then be indispensable, regulated in quantity by the degree of fever; rarely exceeding four quarts, never intentionally pursued until the animal is faint, and immediately stopped when there is the slightest appearance of faintness. The bleeding should be repeated if the pulse is frequent and strong; or if the membrane of the nose is getting red, and the legs cold, and even although weakness should be rapidly coming on; but it should be in small quantity, and the effect of it carefully watched.

If the disease has been suffered to run on for two or three days, and the horse begins to stagger, the practitioner or the owner will consider all the symptoms well before he ventures to bleed. Redness of the nostril, heat of the mouth, quickness and force of pulse, heaving of the flanks, or coldness of the legs, will require the loss of blood, notwithstanding considerable weakness; but if the animal is quite off his feed, and the inside of the nose is livid, and he is fast losing condition as well as strength, bleeding will be better avoided.

It is of importance that the bowels should be evacuated; and there is not so much danger in the use of a little purgative medicine as in inflammation of the lungs. Two drachms of Barbadoes aloes may be given in the form of ball, or in solution; and in twelve hours another drachm may be given, and even a third dose twelve hours after that, if the fæces have not been loosened; taking care to back-rake the animal, and to administer injections of thin gruel.

The sedative medicines at first exhibited should be the same as in inflammation of the lungs, and in the same quantity; but as soon as the fever begins to remit, two drachms of the spirit of nitrous ether should be added to each dose; and, the weakness increasing, and the fever still more subsiding, the chamomile may be ventured on, but with caution. Warm clothing is necessary, and particularly about the head; and although the box should still be airy, it should not be so cool as in inflammation of the lungs. If the throat be so sore that the animal will not eat, either the parotid or the submaxillary glands, or both, should be blistered. It will be far better to blister them at once, than to lose time by the use of weaker and ineffective applications. The discharge from the nose should be promoted, and the natural progress of the inflammation of the membrane of the nose and throat hastened by hot mashes being frequently put in the manger, or, if the horse is not too much distressed by it, hung under his nostril in a common nose-bag. When this is resorted to, a hood about the head will be particularly necessary.

A great deal of weakness soon follows an attack of catarrhal fever, and it will then be necessary, even while we are subduing the fever, to support the strength of the animal. He should be offered bran-mashes, malt-mashes, damped hay, green meat, or carrots. If he refuses to take them, they should be insinuated between his grinders; when, being compelled to bruise them a little in endeavouring to get rid of them, and thus experiencing their taste, he will often be induced to eat several little portions. If he obstinately refuses to feed, he must be drenched with thick gruel; but this will seldom be necessary if all water be refused him from the earliest period of the disease, and a pail with thinner gruel be suspended in some part of his box. When he finds that he can get nothing else, he will drink sufficient of this to afford him all the nutriment we require. The preservation of due warmth in the extremities is as necessary here as in inflammation of the lungs, and should be attempted by warm bandages, and frequent hand-rubbing.

The terminations of this disease most to be dreaded are inflammation of the lungs, and putrid fever. We know how best to guard against the former, and we shall presently speak of the latter. When, however, the disease hangs long upon the horse, there is usually much mischief done in the chest, although the animal may recover. Thick wind, broken wind, and chronic cough are its occasional consequences; and likewise, as the disease has affected so great a portion of the air-passages, a peculiar liability to cold and cough, and, not unfrequently, an unpleasant and troublesome discharge from the nose will remain. Of the latter we have spoken under the title of *nasal gleet*, p. 121; the others will presently come under consideration. The farmer will not forget the infectious nature of this disease, and will immediately separate the sick animal from his companions.

The disease with which catarrhal fever is most likely to be confounded is inflammation of the lungs; and as the treatment of the two is in some particulars so different, the farmer should be enabled readily to distinguish between them. If a little care be used this will not be difficult. The febrile character of the pulse; the early discharge from the nose; the want of intense redness in the lining of the nose; the frequent and painful cough; the enlargement of the glands, and soreness of the throat; the rapid loss of strength, the sometimes constant, and at others variable warmth of the legs; the fidgettiness and pawing, will sufficiently distinguish catarrhal fever from the oppressed pulse, red nostril, heaving flank, little cough, fixedness of limbs, and coldness of the extremities which accompany and characterise inflammation of the lungs.

THE MALIGNANT EPIDEMIC.

This commences with nearly the same symptoms as catarrhal fever; it probably at the beginning is catarrhal fever, but more than usually violent, and sooner exhausting the powers of the frame.

Its symptoms are rapid loss of strength, stinking breath, fœtid discharge from the nostrils, all the evacuations becoming highly offensive, the pulse rapid, small and weak, and the animal obstinately refusing to eat. It soon runs its course. Gangrene soon succeeds to inflammation, and rapidly spreads from the part first inflamed through the whole of the cellular substance, and over every portion of the frame. When veterinary science was in its infancy, this pest used periodically to appear, and carry off hundreds of horses; and that breeder is fortunate, who does not now sometimes suffer from its ravages. The treatment of it is very unsatisfactory. The prevention may be a little more in our power, by endeavouring to get rid of the previous disease by one bleeding, when, in some seasons, catarrhal fever appears under a form more than usually violent; and by bleeding with extreme caution, or not bleeding at all, when debility begins to appear. A mild purgative may be first administered to carry off a portion of the offensive matter contained in the bowels; after which, chalk, and ginger, and opium, and gentian, and columbo, with port-wine, may be plentifully given, with green meat, or thick gruel; but except the horse be valuable, the chance of saving him is so slight, and probably the danger of spreading the pest so great, that prudence will prompt his destruction.

Most frequent in occurrence among the consequences of catarrhal fever, and inflammation of the lungs, is

CHRONIC COUGH.

It would occupy more space than we can devote to this part of our subject, to speak of all the causes of obstinate cough. The irritability of so great a portion of the air-passages, occasioned by previous and violent inflammation of them, is the most frequent. It is sometimes connected with worms. There is much sympathy between the lungs and the intestines, and the one very readily participates in the irritation produced in the other. That it is caused by glanders, can be easily imagined, because that disease is, in its early stage, seated in or near the principal air-passages, and little time passes before the lungs become affected. It is the necessary attendant of thick wind and broken wind, for these proceed from alterations of the structure of the lungs.

Notwithstanding the clearness of the cause, the cure is not so evident. If a harsh hollow cough be accompanied by a staring coat, and the appearance of worms,—a few worm-balls may expel these parasites, and remove the irritation of the intestinal canal. If it proceed from irritability of the air-passages, which will be discovered by the horse coughing after drinking, or when he first goes out of the stable in the morning, or by his occasional throwing out thick mucus from the nose, medicines may be given, and sometimes with advantage, to diminish irritation generally. Half-doses of the digitalis, emetic tartar, and nitre, given every night, have had a very beneficial effect, especially when made up with tar, which seems to have a powerful influence in allaying these irritations. These balls should be regularly given for a considerable time. They are sufficiently powerful to quiet slight excitement of this kind, but not to nauseate the horse, or interfere in the slightest degree with his food or his work. A blister, extending from the root of one ear to that of the other, taking in the whole of the channel, and reaching six or eight inches down the windpipe, has been tried, and not without good effect, on the supposition that the irritation may exist in the fauces or the larynx; and the blister has sometimes been extended through the whole course of the windpipe, until it enters the chest.

Feeding has much influence on this complaint. Too much dry meat, and especially chaff, increases it. It is aggravated when the horse is suffered to eat his litter; and it is often relieved when spring tares are given. Carrots afford decided relief.

The seat of the disease, however, is so uncertain, and all our means and appliances so inefficacious, and the cough itself so little interfering, and sometimes interfering not at all with the health of the animal, that it is scarcely worth while to persevere in any mode of treatment that is not evidently attended with speedy benefit. The principal consideration to induce us to meddle at all with chronic cough is the knowledge that horses afflicted with it are more liable than others to be affected by changes of temperature, and that inflammation of the lungs, or of the respiratory passages, often assumes in them a very alarming character; to which, perhaps, we may add, that a horse with chronic cough cannot legally or properly be warranted sound.

When chronic cough chiefly occurs after eating, the seat of the disease is evidently in the substance of the lungs. The stomach distended with food presses upon the diaphragm, and the diaphragm upon the lungs; and the lungs, already labouring under some congestion, are less capable of transmitting the air. In the violent effort to discharge their function, irritation is produced; and the act of coughing is the consequence of that irritation. This is allied with, or soon runs into

THICK-WIND.

Thick-wind consists in short, frequent, and laborious breathings, and especially when the animal is in exercise; the inspirations and expirations often succeeding each other so rapidly as evidently to express distress, and occasionally almost to threaten suffocation. Some degree of it frequently exists in round-chested and fat horses, that have little or no breeding. The reason of this is sufficiently plain. The circular chest affords sufficient room for the expansion of the lungs when the animal is at rest, and sufficient room for the accumulation of a great deal of fat and flesh; but when the horse is strongly exercised, the circulation of the blood is hurried, and its change from arterial to venous, or from vital to empoisoned blood, is more rapid. The circular chest cannot then enlarge to any great degree: yet the blood must be purified in greater quantity, and therefore what cannot be done by increase of surface, must be accomplished by frequency of action. Heavy draught horses are invariably thick winded, and so are almost all horses violently exercised on a full stomach.

A horse labouring under any inflammatory affection of the lungs is thick-winded, because the pain which he feels in the act of breathing will not permit him to respire deeply, and therefore, he must breathe quickly. A horse unused to exercise is thick-winded, because the lungs will not soon accommodate themselves to a new and laborious action.

The principal cause, however, of thick wind is previous inflammation, and particularly inflammation of the bronchial passages. The throwing out of some fluid, which is capable of coagulation, is the result, or the natural termination of inflammation. This deposit in the substance of the lungs, or in the bronchial tubes, from inflammation of these organs, must close many of the air-cells, and lessen the dimensions of others. Then if the cells, fewer in number and contracted in size, be left for the purposes of breathing, the rapid and laborious action of the lungs must supply the deficiency, and especially when the animal is put in that state in which he requires a rapid change of blood.

The examination of thick-winded horses has thrown considerable light on the nature of the disease. In the majority of instances some of the small air-cells have been found filled up with a dense substance of a blue or darker colour. In others, the minute passages leading to the cells have been diminished, and almost obliterated, the linings of these passages being unnaturally thickened, or covered with hardened mucus; and where neither of these appearances could be observed, the lining of the cells has exhibited evident marks of inflammation, so that absolute pain prevented the full expansion or contraction of the lungs.

Thick-wind is often the forerunner of broken-wind. It is easy to understand this: for if so much labour is necessary to contract the air-cells, and to force out the wind, and the lungs work so rapidly and so violently in effecting this, some of the cells, weakened by disease, will probably be ruptured.

Of the treatment of thick-wind we have little to say. Attention to diet, and the prevention of the overloading of the stomach, and the avoidance of exercise soon after a meal, may in some degree palliate the disease, and so may constant exercise, carried to the extent of the horse's power, without too much distressing him. The capability of exertion will thus daily improve, and the breathing of the horse will become freer and deeper. This is the process of training a horse either for the chase or the course; and this constitutes all the difference between a horse that has been well and one that has been badly trained.

BROKEN-WIND.

This is easily distinguished from thick-wind. In thick-wind the breathing is rapid and laborious, but the inspiration and expiration are equally so, and occupy precisely the same time. In broken-wind the inspiration is performed by one effort; the expiration by two, which is plainly to be distinguished by observing the flanks, and which occupies double the time. The reason of this may easily be stated. Broken-wind is the rupture or running together of some of the air-cells. When the lungs are expanded, the air will rush in easily enough, and one effort of the muscles of respiration is sufficient for the purpose; but when these cells have run into each other, the cavity is so irregular, and contains so many corners and blind pouches that it is exceedingly difficult to force it out again, and two efforts are scarcely competent fully to effect it.

This disease is also accompanied by a dry and husky cough of a peculiar sound, which cannot easily be described, but is recognised by every one accustomed to horses. It is the consequence of thick-wind, and of those alterations of structure consequent on inflammation. If a portion of the lung be lost to the animal, and the same quantity of pure blood must be supplied, while there is not the same surface to supply it, it is easy to suppose that, in the violent efforts which such a horse is compelled to make, some of the cells may be broken.

Broken wind may, however, occur without much previous disease. Suppose a horse to be a gross feeder, and to have filled his stomach with straw and hay, and provender that occupies a great bulk, and contains little nourishment, the lungs are squeezed into a less than the natural compass. Let the horse be now suddenly and smartly exercised; more blood must be purified, and in the violent effort to accomplish this, some of the cells give way. Therefore we do not find broken-winded horses on the race-course, for although every exertion of speed is required from them, their food lies in small compass, and the stomach is not distended, and the lungs have room to play, and care is taken that their exertion shall be required when the stomach is nearly empty. Carriage and coach horses are seldom broken-winded, unless they bring the disease to their work, for they too live principally on corn, and their work is regular, and care is taken that they shall not be fed immediately before their work. The majority of horses thus affected come from the stables of those for whose use these pages are principally designed. The farmer's horse is the broken-winded horse, because that on which he is fed is bulky, and too often selected on account of its cheapness; because there is little regularity in the management of most of the farmers' stables, or the work of his teams; and because after many an hour's fasting the horses are often suffered to gorge themselves with this bulky food; and then, with the stomach pressing upon the lungs, and almost impeding ordinary respiration, they are put again to work, and sometimes to that which requires considerable exertion.

A profitable lesson may be learned from this statement. The farmer perhaps may contrive to give his horses a little more corn, and a little less hay, and straw, and chaff, without much additional expense; he may contrive, too, to shorten the period of fasting, and therefore prevent the ravenous manner in which agricultural horses often feed; and more regularity may take place between the periods of feeding and of work. We have recommended the nose-bag, as a preventive of stomach-staggers; we can as earnestly recommend it as a preventive of broken-wind.

This disease depends as much upon the cramped state of the lungs, from the pressure of an overgorged stomach in the ordinary state of the animal, as on the effects of over-exertion. The agriculturist knows that many a horse becomes broken-winded in the straw-yard. There is little nutriment in the provender which he there finds, and to obtain enough for the support of life, he is compelled to keep the stomach constantly full, and pressing upon the lungs. Some have come up from grass broken-winded that went out perfectly sound. The explanation of this case is the same. The stomach was habitually gorged with coarse and innutritive herbage, and its pressure on the lungs cramped and confined their action, and produced those violent efforts which burst some of the air-cells, and especially when in their gambols in the straw-yard or in the field, or sometimes being wantonly driven about, the lungs were suddenly called upon to perform extraordinary work. There are difficulties attending this explanation of the disease, but it cannot be denied that the dissection of horses which had broken-wind has almost invariably presented these enlarged air-cells, one of which would occupy the space of a great many of their natural dimensions.

The cure of a broken-winded horse no one ever witnessed; yet much may be done in the way of palliation. The food of the animal should consist of much nutriment condensed into a small compass; the quantity of oats should be increased, and that of hay proportionably diminished; the bowels should be gently relaxed by the frequent use of mashes; the water should be given sparingly through the day, although at night the thirst of the animal should be fully satisfied; and exercise should never be taken when the stomach is full. It will scarcely be believed how much relief these simple measures will afford to the broken-winded horse, and of how much exertion he may be gradually rendered capable. Some treated on this plan have even been hunted, and have acquitted themselves well in the field. Carrots are very useful to the broken-winded horse, not only as containing much nutriment and considerable moisture, so that less water may be required, but from some property which they possess rendering them beneficial in every chest affection. A broken-winded horse turned out to grass will never improve, on account of the almost constant distension of the stomach; but he may be fed on more succulent substances, as turnips and mangel-wurzel, with evident advantage. They are easy of digestion, and they soon pass out of the stomach.

Medical treatment is of little avail, except that organs so violently excited as the lungs of broken-winded horses frequently are, must be subject to inflammation, and the difficulty of breathing in these horses is sometimes sadly increased. A little blood may then be subtracted; and other means taken which have been recommended for inflammatory affections of the chest. In cases of frequent or periodical returns of difficulty of breathing, to which these horses are very subject, a course of mild aperients, united with mercury, have been given with decided advantage. Two drachms of aloes, and one of calomel, may be given twice in the week. The barbarous practice of some farriers of making holes near the anus, and sometimes in other parts, to let out the broken wind, cannot be too strongly reprobated.

Thick-wind and broken-wind exist in various degrees, and many shades of difference. Dealers and horsemen generally have characterized them by names that can boast no elegance, but are considerably expressive of the state of the animal. Our readers should not be ignorant of them. Some horses make a shrill noise when in quick action—they are said to be **Pipers**. This is a species of *Roaring*. There is usually a ring of coagulated matter round the inside of the windpipe, by which the cavity is materially diminished, and the sound produced in quick breathing must evidently be shriller. Sometimes the piping is produced by a contraction of the small passages of the lungs.

The **Wheezer** utters a sound not unlike that of an asthmatic person when a little hurried. This is a kind of thick-wind, and is caused by the lodgment of some mucous fluid in the small passages of the lungs. It frequently accompanies *bronchitis*. Wheezing can be heard at all times, even when the horse is at rest in the stable; roaring is confined to the increased breathing of considerable exertion.

The **Whistler** utters a shriller sound than the wheezer, but only when in exercise, and that of some continuance. A sudden motion will not always produce it. It seems to be referable to some contraction in the windpipe or the larynx. The sound is a great nuisance to the rider, and the whistler very speedily becomes distressed. A sharp gallop up hill will speedily detect the whistler.

When the obstruction seems to be principally in the nose, the horse loudly puffs and blows, and the nostrils are dilated to the utmost, while the flanks are comparatively quiet. This animal is said to be a **High-blower**. With all his apparent distress, he often possesses great speed and endurance. The sound is unpleasant, but the lungs may be perfectly sound.

Every horse violently exercised on a full stomach, or when overloaded with fat, will grunt very much like a hog. The pressure of the stomach on the lungs, or that of the fat accumulated about the heart, will so much impede the breathing, that the act of forcible expiration will be accompanied by this kind of sound; but there are some horses who will at all times utter this sound, if suddenly touched with the whip or spur. They are called **Grunters**, and should be avoided. There is some altered structure of the lungs, which prevents them from suddenly accommodating themselves to an unexpected demand for exertion. It is the consequence of previous disease, and is frequently followed by thick, or broken-wind, or roaring.

CHAPTER XI.

THE BELLY AND ITS CONTENTS.

THE DIAPHRAGM.

THE chest is separated from the abdomen or belly, by the diaphragm or midriff, which extends obliquely from the loins to the breast-bone. In its natural state it is convex, or projecting forward towards the lungs, and concave or hollow backward towards the stomach and intestines. On the side towards the chest it is covered by the membrane which invests the lungs, and towards the belly by that which covers the intestines. It is attached to the spine, the ribs, and the breast-bone by tendinous or fleshy expansions, and in the centre it is composed of strong muscular fibres. It is one of the most important muscles of the frame. It is, as we have described it, the principal agent in breathing. When it acts, its fibres are shortened; it loses its convexity and becomes plane; the chest is thereby enlarged, and the lungs enlarge with the expansion of the cavity in which they are placed; and air rushes in, and inspiration is performed. When the fibres of the diaphragm cease to act, that muscle returns to its natural form; it becomes again convex; it presses upon the lungs, and helps to force out the air, and expiration is accomplished. It assists likewise in the natural constant motion of the bowels, and lends its powerful aid in the expulsion of the dung and urine, and in the birth of the young animal. It is most concerned in coughing, yawning, sighing, &c. The membrane which covers the diaphragm is very subject to inflammation. Whether the original seat of disease be in the lungs or the bowels, the diaphragm soon becomes inflamed and irritable, which accounts for the breathing of the horse being so much affected under every inflammation of the chest or belly. The diaphragm is likewise occasionally ruptured, principally from violent exertion. It has so much to do in the act of breathing, that it is not to be wondered if, when the respiration is exceedingly hurried, this muscle should give way. The symptoms of ruptured diaphragm are very obscure. There are none on which we can perfectly depend. This, however, is a matter of little consequence, for it is uniformly fatal. If the rupture be small, some portion of the intestines insinuates itself, and becomes entangled, and the passage is incurably obstructed; and if the aperture be large, so much of the intestine passes through as to press upon the lungs, and render breathing impossible.

Three large vessels pass through the diaphragm; the great artery which conveys the blood from the heart to the hinder part of the frame, and which goes through a kind of division of the diaphragm, so that it cannot be pressed upon; the great vein carrying the blood from the hinder parts and the liver to the heart, and which penetrates the firm tendinous part of the diaphragm so as likewise to be preserved from pressure; and the gullet, which passes through the most fleshy portion of the diaphragm, and is liable to be compressed by the constant action of this muscle, which, however, is a matter of little consequence, for there is sufficient power in the muscles of the gullet to propel the food through the diaphragm into the stomach.

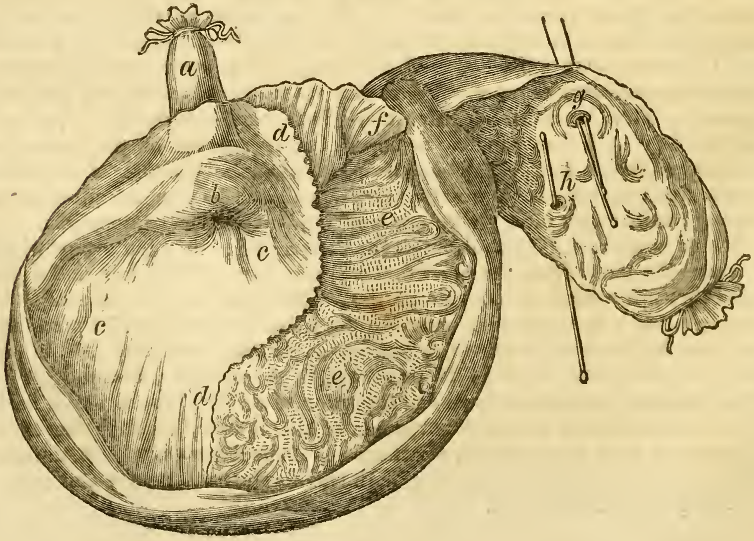
The gullet terminates in

THE STOMACH,

Which is found on the left side of the belly, lying upon the large intestines; its fore part close to the liver; and its left side in contact with the diaphragm. This situation of the stomach will at once explain the reason why a horse is so much distressed, and sometimes irreparably injured if worked hard immediately after a full meal. The stomach must be displaced and driven back in the belly by every contraction of the diaphragm or act of inspiration; then in proportion to the fulness of the stomach will be the weight to be overcome, and the labour of the diaphragm, and the exhaustion of the animal. If the stomach be much distended, it may be too weighty to be forced sufficiently far back to make room for the quantity of air which the animal in a state of exertion requires. Hence the frequency and labour of the breath, and the quickness with which such a horse is blown, or, possibly, destroyed. Hence the folly of giving too full a meal, or too much water before the horse starts on a journey or for the chase; and hence, likewise, the absurdity and danger of that unpardonable custom of some grooms to gallop the horse after his drink, in order to warm it in his belly, and prevent gripes.

The horse was destined to be the servant of man, and to serve him at all hours, and whether fasting or full: it would seem, therefore, that to lessen the inconvenience or danger of the pressure of the stomach on the diaphragm, a smaller stomach, in proportion to his size, is given to the horse than to almost any other animal. The bulk of the horse, and the services required of him, demand much nutriment; and his nutriment is of such a nature that it must occupy a very considerable space, yet his stomach, compared with his bulk, is not half so large as that of the human being; and therefore, although he, like every other animal, feels inconvenience from great exertion immediately after a full meal, he feels not so much as other animals, for his stomach is small, and a great proportion of what he eats rapidly passes through it, and descends to a part of the intestines distant from the diaphragm, and where the existence and pressure of the food cannot cause him any annoyance.

CUT OF THE STOMACH.



a The œsophagus or gullet, extending to the stomach.

b The entrance of the gullet into the stomach. The circular layers of the mucsles are very thick and strong, and which, by their contractions, help to render it difficul for the food to be returned or vomited.

c The portion of the stomach which is covered by cuticle or insensible skin.

d d The margin which separates the cuticular from the villous portion.

e e The mucous or villous (velvet) portion of the stomach, in which the food is principally digested.

f The communication between the stomach and the first intestine.

g The common orifice through which the bile and the secretion from the pancreas pass into the first intestine. The two pins mark the two tubes here united.

h A smaller orifice, through which a portion of the secretion of the pancreas enters the intestines.

The orifice by which the gullet enters the stomach is called the *cardiac*, *b*, from its nearness to the heart, or sympathy with it. It is constantly closed by strong muscular fibres, except when food is passing into the stomach. It is the construction of the soft palate, however, as has been already described, and not this closing of the cardiac orifice of the stomach, that chiefly prevents the act of vomiting in the horse.

The stomach has four coats. The outermost is the lining of the cavity of the belly, and the common covering of all the intestines; by which they are all confined in their respective situations, and from which a fluid is given out, which prevents all friction between them. This is called the *peritoneum*, or that which stretches round.

The second is the muscular coat, consisting of two layers of fibres, one running lengthways, and the other circularly, and by means of which a constant gentle motion is communicated to the stomach, by which the food is more thoroughly mixed together, and prepared for digestion, and by the pressure of which also the food when properly prepared is pushed on into the intestines.

The third, or cuticular, (*skin-like coat*,) *c*, covers but a portion of the inside of the stomach. It is a continuation of the lining of the gullet. There are numerous glands on it, which pour out a mucous fluid; and it is, probably, intended to be a reservoir in which a portion of the food is retained for a while, and softened and better prepared for the action of the other or true digestive portion of the stomach. The cuticular coat occupies nearly one half of the inside of the stomach.

The fourth coat is the mucous or villous (velvet) coat, *e*, where the work of digestion properly commences. The mouths of numerous little vessels open upon it, pouring out a peculiar fluid, the *gastric* (stomach) juice, which mixes with the food already softened, and converts it into a fluid called *chyme*. As this is formed, it passes out of the other orifice of the stomach, the *pyloric*, (a door to guard,) *f*, and enters the first small intestine; the harder and undissolved parts being turned back to undergo further action.

The stomach of the horse being small, this wonderful change which is effected in the food, and the nature of which has never been thoroughly understood, proceeds very rapidly. The horse, in a short time, will eat a great deal more than the stomach will hold, and room can only be made for the reception of the fresh food by that which had been previously received being discharged through the pyloric orifice.

Of one disease of the stomach, arising from over distension, *stomach-staggers*, we have already spoken. In a few instances the stomach has been known to be distended with air, but there are no characteristic symptoms by which this may be distinguished from distension by food, and the treatment would be the same.

Of inflammation of the stomach in the horse, except from poisonous herbs or drugs, we know little. It very rarely occurs, and then can with difficulty be distinguished from inflammation of the bowels, and in both diseases the assistance of a skilful veterinary surgeon is required.

Few horses are destroyed by the poisonous plants in our meadows. Natural instinct teaches them to avoid those which would be injurious. More are destroyed by the leaves of the *yew* than by any other vegetable poison. A sleepiness, from which the animal can scarcely be roused, steals over him, and he dies without any symptom of pain.—Ten grains of the farina of the croton nut should be given, as soon as the poisoning is suspected; he should be drenched largely with equal parts of vinegar and thin gruel, and the croton repeated in six hours, if it has not previously operated.

The *Water Dropwort*, common in ditches and marshy places, is generally refused by horses; but brood-mares, with appetite somewhat vitiated from their being in foal, have been destroyed by it. The antidote would be vinegar and gruel, and bleeding if there be inflammation.

The *Water Parsley* deserves not all the bad reputation it has acquired, although, when eaten in too great quantities, it has produced palsy in the horse, and which has been strangely attributed to a harmless beetle that inhabits the stem.

Of the *Common Hemlock* and the *Water Hemlock* we know no harm, so far as the horse is concerned. We have repeatedly seen him eat the latter without bad effects, but cows have been poisoned by it.

Of the mineral poisons we will mention only two. *Arsenic* was formerly celebrated as a tonic and a destroyer of worms in the horse; and doses sufficient to kill three or four men used to be daily administered, and generally with impunity; the dose has, however, in some cases been too strong, and the animal has died. There are better tonics and vermifuges, and the drug will probably soon be discarded from veterinary practice. *Corrosive sublimate* is given internally, and often with advantage in farcy. It is used externally to destroy vermin, to cure mange, and to dispose deep and fistulous ulcers to heal. The symptoms of an over-dose of either are loss of appetite, discharge of saliva from the mouth, pawing, looking eagerly at the flanks, rolling, profuse perspiration, thready pulse, rapid weakness, violent purging and straining, convulsions, and death.

The stomach will be found intensely inflamed, with patches of yet greater inflammation. The whole course of the intestine will be inflamed, with particular parts black and gangrenous.

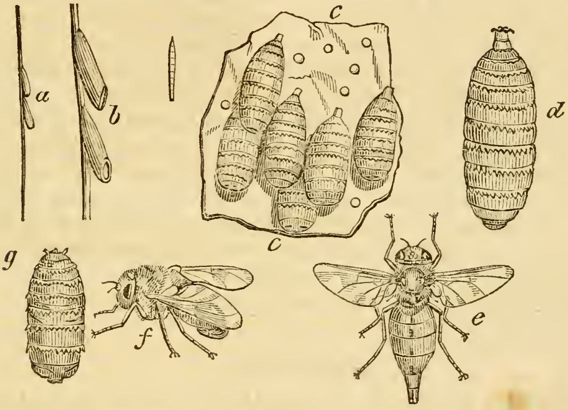
The antidote, if it be not too late to administer it, would be, for arsenic, lime water, or chalk and water, or soap and water, given in great quantities with the stomach-pump; and for corrosive sublimate, the white of eggs mixed with water, or thick starch, or arrow-root. If the poisoning be malicious, arsenic may be most readily detected by mixing a little of the fluid taken from the intestines with a weak solution of blue vitriol, to which a little hartshorn has been added—the mixture will gradually become green; or, if a little of the more solid contents of the stomach or small intestines be thrown on a red-hot iron, a smell of garlic will be perceived.

For corrosive sublimate there is a simpler test. Place a drop of the suspected fluid on a sovereign, let the stem of a small key touch the sovereign while the handle is brought into contact with the drop, and the gold will immediately be stained; or mix a little of the suspected fluid with lime water, and the corrosive sublimate, if there be any, will be thrown to the bottom, of an orange colour; or if hartshorn be used, the precipitate will be white.

BOTS.

In the spring and early part of the summer, horses are much troubled by a grub or caterpillar, which crawls out of the anus, fastens itself under the tail, and seems to cause a great deal of itching or uneasiness. Grooms are sometimes alarmed at the appearance of these insects. Their history is curious, and will dispel every fear with regard to them. We are indebted to Mr. Bracy Clark for almost all we know of the bot.

CUT OF THE BOT.



a and *b* The eggs of the gad-fly, adhering to the hair of the horse.
c The appearance of the bots on the stomach, firmly adhering by their hooked mouths. The marks or depressions are seen which are left on the coat of the stomach when the bots are detached from their hold.
d The bot detached.
e The female of the gad-fly, of the horse, prepared to deposit her eggs.
f The gad-fly by which the red bots are produced.
g The smaller or red bot.

A species of gad-fly, *e*, the œstrus equi, is in the latter part of the summer exceedingly busy about the horse. They are observed to be darting with great rapidity towards the knees and sides of the animal. The females are depositing their eggs on the hair, and which adhere to it by means of a glutinous fluid with which they are surrounded, (*a* and *b*.) In a few days the eggs are ready to be hatched, and the slightest application of warmth and moisture will liberate the little animals which they contain. The horse in licking himself touches the egg, it bursts, and a small worm escapes, which adheres to the tongue, and is conveyed with the food into the stomach; there it clings, by means of a hook on either side of its mouth, to the cuticular portion of the stomach, *c*; and its hold is so firm and so obstinate, that it will be broken before it will be detached. It remains feeding there on the mucus of the stomach during the whole of the winter, and to the end of the ensuing spring; when, having attained a considerable size, *d*, and being destined to undergo a certain transformation, it disengages itself from the cuticular coat, is carried into the villous portion of the stomach with the food, passes out of it with the chyme, and is at length evacuated with the dung.

The *larva* or maggot being thus thrown out seeks shelter in the ground, contracts in size, and becomes a chrysalis or grub; in which state it lies inactive for a few weeks, and then, bursting from its confinement, assumes the form of a fly. The female, becoming impregnated, quickly deposits her eggs on those parts of the horse which he is most likely to lick, and so the species is perpetuated.

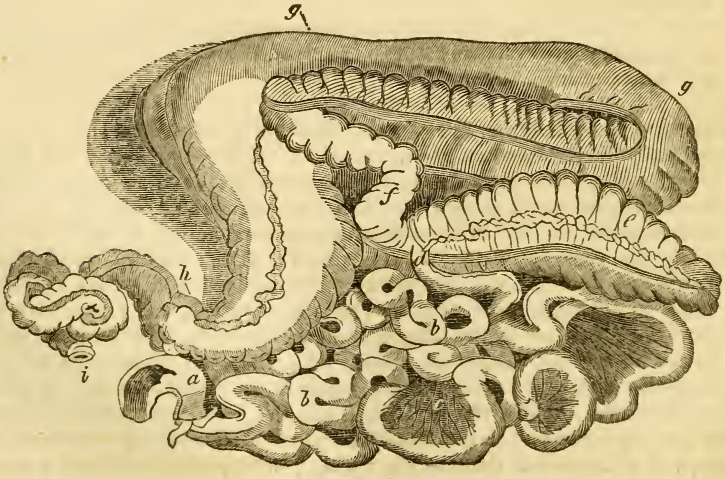
There are several plain conclusions from this history. The bots cannot, while they inhabit the stomach of the horse, give the animal any pain, for they are fastened on the cuticular and insensible coat. They cannot stimulate the stomach and increase its digestive power, for they are not on the digestive portion of the stomach. They cannot, by their roughness, assist the trituration or rubbing down of the food, for no such office is performed in that part of the stomach—the food is softened, not rubbed down. They cannot be injurious to the horse, for he enjoys the most perfect health when the cuticular part of his stomach is filled with them, and their presence is not even suspected until they appear at the anus. They cannot be removed by medicine, because they are not in that part of the stomach to which medicine is usually conveyed; and if they were, their mouths are too deeply buried in the mucus for any medicine, that can safely be administered, to affect them; and, last of all, in due course of time they detach themselves, and come away. Therefore, the wise man will leave them to themselves, or content himself with picking them off when they collect under the tail and annoy the animal.

The smaller bot, *f* and *g*, is not so frequently found.

INTESTINES.

The food having been partially digested in the stomach, and converted into chyme, passes through the pyloric orifice into the intestines.

CUT OF THE INTESTINES.



- *a* The commencement of the small intestines. The ducts which convey the bile and the secretion from the pancreas are seen entering a little below.
- *b b* The convolutions or windings of the small intestines.
- *c* A portion of the mesentery.
- *d* The small intestines terminating in the cœcum.
- *e* The cœcum or blind gut, with the bands running along it, puckering and dividing it into numerous cells.
- *f* The beginning of the colon.
- *g* The continuation and expansion of the colon, divided like the cœcum into cells.
- *h* The termination of the colon in the rectum.
- *i* The termination of the rectum at the anus.

The intestines of a full grown horse are not less than ninety feet in length. The length of the intestines in different animals depends on the nature of the food. The nutritive matter is with much more difficulty extracted from vegetable than animal substances, therefore the alimentary canal is large, long, and complicated, in those which, like the horse, are fed on herbs alone. They are divided into the small and large intestines; the former of which occupy about sixty-six feet, and the latter twenty-four. The intestines, like the stomach, are composed of three coats. The outer one consists of the peritoneum, that membrane which we have already described as covering the contents of the belly. By means of this coat the bowels are confined in their proper situations; and, this membrane being smooth and moist, all friction and concussion are avoided. Did the bowels float loosely in the belly they would be subject to constant entanglement and injury amid the rapid and violent motions of the horse.

The middle coat, like that of the stomach, is muscular, and composed of two layers of fibres, one running longitudinally, and the other circularly; and by means of these muscles, which are continually contracting and relaxing from the upper part downward, the food is forced along the bowels. The inner coat is the mucous or villous;—mucous, because it abounds with small glands which pour out a mucous fluid to lubricate the passage and defend it from irritating or acrimonious substances; and villous from its soft velvet feel. This coat is crowded with innumerable little mouths, which are the commencement of minute vessels, by which the nutritive part of the food is taken up; and these vessels, uniting and passing over the mesentery, carry this nutritive matter to a receptacle for it, whence it is conveyed into the circulation and distributed to every part.

The intestines are more particularly retained in their places by the *mesentery*, *c*, (middle of the intestines,) which is a doubling of the peritoneum, including the intestine in its bottom, and likewise inclosing between its folds the arteries and veins, and nerves, and the vessels which convey the nutriment from the intestines to the circulation. The mesentery has somewhat the appearance of an expanded fan, and all these things ramifying between its transparent folds, give it a beautiful appearance.

The first of the small intestines is the *Duodenum*, *a*, so called because, in the human subject, it is about twelve inches long. In the horse it is nearly two feet in length. It is the largest in circumference of all the small intestines. It receives the food converted into chyme by the digestive power of the stomach, which in it undergoes another and very important change; a portion of it is converted into *chyle.* It is mixed with the bile and the secretion from the pancreas, which enter about five inches down the intestine. The bile seems to be the principal agent in this change; no sooner does it mingle with the chyme, than the fluid begins to be separated into two distinct ingredients; a white thick liquid, termed chyle, and containing the nutritive part of the food, and a yellow, pulpy substance, which becomes the excrement. As these matters pass on by the motion of the intestines, the separation becomes more complete; the chyle is gradually taken up by the mouths of these numerous little vessels, which are called the lacteals, and at length the excrement alone remains.

The next portion of the small intestine is the *Jejunum*, so called, because it is generally empty. The passage of the food seems to be very rapid through it. It is smaller in bulk, and paler in colour, than the duodenum.

To this succeeds the *Ileum;* but there is no point at which it can be said that the jejunum terminates, and the ileum begins, except, that the latter is said to be about one-fifth longer than the former. The whole of these small intestines will contain about eleven gallons of water.

At the termination of the ileum, *d*, commence the large intestines. The first of them is the *Cæcum* (blind), *c*, it has but one opening into it, and consequently every thing that passes through it, having reached the blind or closed end, must return, in order to escape. It is not a continuation of the ileum, but the ileum pierces the head of it, as it were, at right angles, (*d*,) and projects some way into it, and has a valve at its extremity, so that what has traversed the ileum, and entered the head of the colon whence the cæcum arises, cannot return into the ileum. Along the outside of the cæcum run three strong bands, each of them shorter than that intestine, and therefore puckering it up, and forming it into three sets of cells, as shewn in the accompanying side cut.

That portion of the food, then, which has not been taken up by the lacteals or absorbent vessels of the small intestines, passes through this valvular opening of the ileum, and a part of it enters the colon, while the remainder flows into the cæcum. Then, from this being a blind pouch, and from the cellular structure of this pouch, the food must be detained in it a very long time; and in order that, during this detention, all the nutriment may be extracted, the cæcum and its cells are largely supplied with blood-vessels and absorbents. It is principally the fluid part of the food that seems to enter the cæcum. A horse will drink at once a great deal more than his stomach will contain, or even if he drinks a less quantity, it remains not in the stomach or small intestines, but passes on to the cæcum, and there is retained, as in a reservoir, to supply the wants of the system. In his state of servitude the horse does not often drink more than twice or thrice in a day, and the food of the stabled horse being chiefly dry, this *water stomach* is most useful to him. The cæcum will hold four gallons.

The greater portion of the food, and the more solid part of it, goes on to the colon (*g g*). This is an intestine of exceedingly large dimensions; it is capable of containing no less than twelve gallons of liquid or pulpy food. At its union with the cæcum and the ileum, although larger than the latter intestine (*f*), it is of comparatively small bulk, but it soon swells out to an enormous extent. It has likewise, in the greater part of its course, three bands like the cæcum, which also divide it, internally, into the same description of cells. The intention of this is evident,—to retard the progress of the food, and to give a more extensive surface on which the vessels of the lacteals may open: and therefore, in the colon, all the chyle is finally separated and taken up. When this is nearly accomplished, the construction of the colon is somewhat changed: we find but two bands towards the rectum, and these not puckering the intestine so much, or forming such numerous or deep cells. The food does not require to be much longer detained, and the mechanism for detaining it is gradually disappearing. The blood-vessels and absorbents are likewise rapidly diminishing. The colon, also, once more contracts in size, and the chyle having been all absorbed, the remaining mass, being of a harder consistence, is moulded into pellets or balls in its passage through these shallower cells.

At the termination of the colon, the *Rectum* (straight gut) commences. It is smaller in circumference and capacity than the colon, and serves as a reservoir for the dung until it is evacuated. It has none of these bands, because, all the nutriment being extracted, the passage of the excrement that remains should be hastened and not retarded. This descends to the lower part of the rectum, which somewhat enlarges to receive it; and when it has accumulated to a certain extent, the animal, by the aid of the diaphragm and the muscles of the belly, presses it out, and it is evacuated. A curious circular muscle, and always in action, called the sphincter (binder together), is placed at the anus, to prevent the constant and unpleasant dropping of the fæces, and to retain them until the animal is disposed voluntarily to expel them.

DISEASES OF THE INTESTINES.

These form a very important part of horse surgery, and many erroneous notions are prevalent respecting them. The first disease we will consider is

SPASMODIC COLIC.

We have said, that the passage of the food through the intestinal canal is effected by the alternate contraction and relaxation of the muscular coat of the intestines. When that action is simply increased through the whole of the canal, the food passes more rapidly, and purging is produced; but the muscles of every part of the frame are liable to irregular and spasmodic action, and the muscular coat of some portion of the intestines may be thus affected. A species of cramp may attack a portion of the intestines. The spasm may be confined to a very small part of the canal. The gut has been found, after death, strangely contracted in various places, contraction not extending above five or six inches in any of them. In the horse, the ileum is the usual seat of this disease. It is of much importance to distinguish between spasmodic colic and inflammation of the bowels, for the symptoms have considerable resemblance, although the mode of treatment should be very different.

The attack of colic is usually very sudden. There is often not the slightest warning. The horse begins to shift his posture, look round at his flanks, paw violently, strike his belly with his feet, lie down, roll, and that frequently on his back. In a few minutes the pain seems to cease, the horse shakes himself, and begins to feed; but, on a sudden, the spasm returns more violently, every indication of pain is increased, he heaves at the flanks, breaks out into a profuse perspiration, and throws himself more violently about. In the space of an hour or two, either the spasms begin to relax, and the remissions are of longer duration, or the torture is augmented at every paroxysm, the intervals of ease are fewer and less marked, and inflammation and death supervene.

Of the symptoms by which it may best be distinguished from inflammation of the bowels, we shall speak when we treat of that disease. Among the causes of colic are, the drinking of cold water when the horse is heated. There is not a surer cause of violent spasm than this. Colic will sometimes follow the exposure of a horse to the cold air, or a cold wind after violent exercise. Green meat, although, generally speaking, most beneficial to the horse, yet given in too large a quantity, or when the horse is hot, will frequently produce gripes. In some horses there seems to be a constitutional predisposition to colic. They cannot be hardly worked, or exposed to unusual cold, without a fit of it. In many cases, when these horses have died, stones have been found in some part of the alimentary canal.

Fortunately, we are acquainted with several medicines that allay these spasms; and the disease often ceases almost as suddenly as it appeared. Turpentine is one of the most powerful remedies, especially if given in union with opium. Three ounces of spirit or oil of turpentine, with an ounce of laudanum, given in a pint of warm ale, will frequently have an almost instantaneous effect. The account which we have just given of the cœcum will not be forgotten. Even a small quantity of fluid will seldom be detained in the stomach, but will pass through the ileum to the cœcum or water-stomach, and in this passage will come in immediate contact with the spasmed part.

If relief be not obtained in half an hour it will be prudent to bleed, because the continuance of violent spasm will produce inflammation. Some practitioners bleed at first, and it is far from bad practice; for although the majority of cases will yield to turpentine, opium, and aloes, an early bleeding may occasionally prevent the occurrence of inflammation, or at least mitigate it. If it be clearly a case of colic, half of the first dose may be repeated, with a full ounce of Barbadoes aloes dissolved in warm water. The stimulus produced on the inner surface of the bowels by the purgative may counteract the irritation which caused the spasm. The belly should be well rubbed with a brush or warmed cloth, but not bruised and injured by the broom-handle rubbed over the belly by two great fellows with all their strength. The horse should be walked about, or trotted moderately. The motion thus produced in the bowels, and the friction of one intestine over the other, may relax the spasm, but the hasty gallop may speedily cause inflammation to succeed to colic. Clysters of warm water, or containing a solution of aloes, will be injected. The patent syringe will here be most useful.

When relief has been obtained, the clothing of the horse, saturated with perspiration, should be removed, and fresh, dry clothing substituted. He should be well littered down in a warm stable or box, and have bran mashes for the two or three next days, and drink only lukewarm water.

Some persons give gin, and even gin and pepper, in cases of gripes. This, however, is a practice to which we strongly object; it may be useful, or even sufficient, in ordinary cases of colic, but if there be any inflammation or tendency to inflammation, it cannot fail to be highly injurious.

CALCULI, OR STONES IN THE INTESTINES.

We have mentioned these as a cause of colic in horses that are subject to frequent attacks of it. Some indigestible substance lodges in the cœcum or colon: earthy, or half-digested vegetable matter gradually accumulates around this, and a ball, weighing many pounds, is sometimes formed. This will produce colic, or obstruct the passage of the gut, or, by its pressure, produce inflammation; but as there are few or no symptoms by which the presence of these stones is clearly indicated, and few, or rather, no certain means, by which they may be removed, we will pass on to an occasional consequence of colic.

INTUSUSCEPTION OF THE INTESTINES.

The spasmodic action of the ileum long continued, may be succeeded by an inverted action from the cœcum towards the stomach, more powerful than the natural action; and the contracted portion of the intestine is thus forced into a portion above it that retains its natural calibre; and the irritation caused by this increases the action, until more is forced in, and an obstruction is formed which no power can overcome. Even the natural motion of the bowels will be sufficient to produce intususception, when the contraction of a portion of the ileum is very great. There are no symptoms to indicate the presence of this, except continued and increasing pain; or if there were, all our means of relief would here fail.

ENTANGLEMENT OF THE BOWELS.

This is another and more singular consequence of colic. Although the ileum is enveloped in the mesentery, and its motion to a considerable degree confined, yet under the spasm of colic, and during the violence with which the animal rolls and throws himself about, portions of the ileum become so entangled as to be twisted into nooses and knots, drawn together with a degree of tightness scarcely credible. Nothing but the extreme and lengthened torture of the animal can lead us to suspect that this has taken place, and, could we ascertain its existence, there would be no cure.

INFLAMMATION OF THE BOWELS.

There are two varieties of this malady. The first is inflammation of the external coats of the intestines, accompanied by considerable fever and costiveness. The second is that of the internal or mucous coat, usually the consequence of an over-dose of physic, and accompanied by violent purging. We will here speak of the first of these affections. It has been divided into inflammation of the peritoneal coat, and that of the muscular: but the causes, symptoms, and treatment of both are so much alike, that it would be raising unnecessary difficulties to endeavour to distinguish between them. Inflammation of the external coats of the stomach, whether the peritoneal or muscular, or both, is a very frequent and fatal disease. It speedily runs its course, and it is of great consequence that its early symptoms should be known. If the horse has been carefully observed, restlessness and fever will have been seen to precede the attack; in many cases a direct shivering fit will be observed; the mouth will be hot, and the nose red. The horse will soon express the most dreadful pain by pawing, striking at his belly, looking wildly at his flanks, groaning and rolling.

The pulse will be quickened and small; the ears and legs cold; the belly tender and sometimes hot; the breathing quickened; the bowels costive; and the horse becoming rapidly and fearfully weak.

It may be useful to give a short table of the distinguishing symptoms of colic and inflammation of the bowels, because the treatment recommended for the former would often be fatal in the latter.

COLIC.	INFLAMMATION OF THE BOWELS.
Sudden in its attack.	Gradual in its approach, with previous indications of fever.
Pulse rarely much quickened in the early period of the disease, and during the intervals of ease: but evidently fuller.	Pulse very much quickened, but small, and often scarcely to be felt.
Legs and ears of the natural temperature.	Legs and ears cold.
Relief obtained from rubbing the belly.	Belly exceedingly tender and painful to the touch.
Relief obtained from motion.	Motion evidently increasing the pain.
Intervals of rest.	Constant pain.
Strength scarcely affected.	Rapid and great weakness.

The causes of this disease are, first of all, and most frequently, sudden exposure to cold. If a horse that has been highly fed, carefully groomed, and kept in a warm stable, be heated with exercise, and have been for some hours without food; and in this state of exhaustion be suffered to drink freely of cold water, or be drenched with rain, or have his legs and belly washed with cold water, an attack of inflammation of the bowels will often follow. An overfed horse subjected to severe and long-continued exertion, if his lungs were previously weak, will probably be attacked by inflammation of them; but if the lungs were sound, the bowels will on the following day be the seat of disease. Stones in the intestines are an occasional cause of inflammation, and colic neglected, or wrongly treated, will terminate in it.

The treatment of inflammation of the bowels, like that of the lungs, should be prompt and energetic. The first and most powerful means of cure will be bleeding. From six to eight or ten quarts of blood should be taken as soon as possible, and the bleeding repeated to the extent of four or five quarts more if the pain be not relieved, and the pulse have not become rounder and fuller. The speedy weakness that accompanies this disease should not deter from bleeding largely. It is the weakness that is the consequence of violent inflammation of these parts, and if that inflammation be subdued by the loss of blood, the weakness will disappear. The bleeding should be effected on the first appearance of the disease, for there is no malady that so quickly runs its course.

Next to bleeding will follow clysters. Although the bowels are usually confined, we cannot administer a strong purgative*; the intestines are already in far too irritable a state. The clyster may consist of warm water, or very thin gruel, in which half a pound of Epsom salts, or half an ounce of aloes has been dissolved, and too much fluid can scarcely be thrown up. If the common ox-bladder and pipe be used, it should be frequently replenished: but with Reed's patent pump, already referred to, sufficient may be injected to penetrate beyond the rectum, and reach to the colon and cœcum, and dispose them to evacuate their contents. The horse may likewise be encouraged to drink plentifully of warm water or thin gruel; and draughts, each containing a couple of drachms of dissolved aloes, may be given every six hours, until the bowels are freely opened.

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* The human practitioner gives, under this disease, and with advantage, very powerful doses of purgative medicine; and he may be disposed to demur to the cautious mode of proceeding we recommend with regard to the horse. Although we may not be able to give him a satisfactory theoretical reason in defence of our treatment, we can appeal to the experience of every veterinary surgeon, that a strong dose of physic given in inflammation of the bowels would be certain poison.

Next, it will be prudent to endeavour to excite considerable external inflammation, as near as possible to the seat of internal disease, and therefore the whole of the belly should be blistered. In a well-marked case of this inflammation, no time should be lost in applying fomentations, but the blister be at once resorted to. The tincture of Spanish flies, whether made with spirit of wine or turpentine, should be well rubbed in. The legs should be well bandaged, to restore the circulation to them, and thus lessen the flow of blood to the inflamed part, and for the same reason the horse should be warmly clothed, but the air of the stable or box should be cool.

No corn or hay should be given during the disease, but bran-mashes, and green meat if it can be procured. The latter will be the best of all food, and may be given without the slightest apprehension of danger. When the horse begins to recover, he may get a handful of corn two or three times in the day, and, if the weather be warm, may be turned into a paddock for a few hours in the middle of the day. Clysters of gruel should be continued for three or four days after the inflammation is beginning to subside, and good hand-rubbing applied to the legs.

The second variety of inflammation of the bowels affects the internal or mucous coat, and is generally the consequence of physic given in too great quantity, or of an improper kind. The purging is more violent, and continues longer than was intended; the animal shews that he is suffering great pain; he frequently looks round at his flanks; his breathing is laborious, and the pulse is quick and small; not so small, however, as in inflammation of the peritoneal coat, and, contrary to some of the most frequent and characteristic symptoms of that disease, the mouth is hot, and the legs and ears are warm. Unless the purging is excessive, and the pain and distress great, we should hesitate at administering any astringent medicine at first. We should plentifully administer gruel, or thin starch, or arrow-root, by the mouth and by clyster, removing all hay and corn, and particularly green meat. We should endeavour thus to sheath the irritated surface of the bowels, while we permitted any remains of the medicine to be carried off. If, however, twelve hours should pass, and the purging and the pain remain undiminished, we should continue the gruel, but add to it chalk, catechu, and opium, in doses of an ounce of the first, a quarter of an ounce of the second, and two scruples of the last, repeated every six hours. As soon as the purging begins to subside, the astringent medicine should be lessened in quantity, and gradually discontinued. Bleeding will rarely be necessary unless the inflammation be very great, and attended by symptoms of general fever. The horse should be warmly clothed, and be placed in a warm stable, and his legs should be hand rubbed and bandaged.

Violent purging, and attended with much inflammation and fever, will sometimes occur from other causes. Green meat will sometimes purge. A horse worked hard upon green meat will scour. The remedy is change of diet, or less labour. Young horses will scour, and sometimes without any apparent cause. Astringents should be used with much caution here. It is probably an effort of nature to get rid of something that offends. A few doses of gruel will assist in effecting this purpose, and the purging will cease without astringent medicine.

Some horses that are not *well ribbed home*, (having too great space between the last rib and the hip-bone,) are subject to purging if more than usual exertion is required from them. They are recognised by the term of *washy* horses. They are often free and fleet, but destitute of continuance. They should have rather more than the usual allowance of corn, with beans, when at work; and a cordial ball, with one drachm of catechu, and ten grains of opium will often be serviceable either before or after a journey

WORMS.

Worms of different kinds inhabit the intestines; but except when they exist in very great numbers, they are not so hurtful as is generally supposed, although the groom or carter may trace to them hidebound, and cough, and loss of appetite, and gripes, and megrims, and a variety of other ailments. Of the origin or mode of propagation of these parasitical animals we will say nothing; neither writers on medicine, nor even on natural history, have given us any satisfactory account of the matter.

The long white worm (*lumbricus teres*) much resembling the common earth-worm, and, being from six to ten inches long, inhabits the small intestines. It is a formidable looking animal, and if there are many of them they may consume more than can be spared of the nutritive part of the food or the mucus of the bowels; and we think that we have seen a tight skin, and rough coat, and tucked up belly, connected with their presence. They have then, however, been voided in large quantities, and when they are not thus voided we should be disposed to trace these appearances to other causes. A dose of physic will sometimes bring away almost incredible quantities of them. Calomel is frequently given as a vermifuge. The seldomer this drug is administered to the horse the better. It is the principal ingredient in some quack medicines for the expulsion of worms in the human subject, and thence, perhaps, it came to be used for the horse, but in him we believe it to be inert as a vermifuge, or only useful as quickening the operation of the aloes. When the horse can be spared, a strong dose of physic is an excellent vermifuge, so far as the long round worm is concerned; but perhaps a better medicine, and not interfering with either the feeding or work of the horse, is two drachms of emetic tartar, with a scruple of ginger, made into a ball, with linseed meal and treacle, and given every morning half an hour before the horse is fed.

A smaller, darker coloured worm, called the needle worm, or *ascaris*, inhabits the large intestines. Hundreds of them sometimes descend into the rectum, and immense quantities have been found in the cœcum. These are a more serious nuisance that the former, for they cause a very troublesome irritation about the fundament, which sometimes sadly annoys the horse. Their existence can generally be discovered, by a small portion of mucus, which hardening, is converted into a powder, and is found about the anus. Physic will sometimes bring away great numbers of these worms, but when there is much irritation about the tail, and much of this mucus indicating that they have descended into the rectum, an injection of a quart of linseed oil, or of an ounce of aloes dissolved in warm water, will be a more effectual remedy.

The tape worm is seldom found in the horse.

PHYSICKING.

This would seem to be the most convenient place to speak of physicking horses, a mode of treatment necessary under various diseases, but which has injured the constitution of more horses, and in fact absolutely destroyed more of them, than any other thing that can be mentioned. When a horse comes from grass to hard meat, or from the cool open air to a heated stable, a dose of physic or even two doses may be useful to prevent the tendency to inflammation which must be the necessary consequence of so sudden and great a change. To a horse that is becoming too fat, or has surfeit, or grease, or mange, or that is out of condition from inactivity of the digestive organs, a dose of physic is often most serviceable; but we do enter our protest against the periodical physicking of all horses in the spring and the autumn, and more particularly against that severe system which is thought to be necessary to train them for work, and the absurd method of treating the horse when under the operation of physic.

A horse should be carefully prepared for the action of physic. Two or three bran-mashes given on that or the preceding day are far from sufficient, when a horse is about to be physicked, whether to promote his condition or in obedience to custom. Mashes should be given until the dung becomes softened; a less quantity of physic will then suffice, and it will more quickly pass through the intestines, and be more equally diffused over them. Five drachms of aloes, given when the dung has thus been softened, will act much more effectually, and much more safely than seven drachms, when the lower intestines are obstructed by hardened fæces.

On the day on which the physic is given, the horse should have walking exercise, or may be gently trotted for a quarter of an hour twice in the day; but after the physic begins to work, he should not be moved from his stall. Exercise then would produce gripes, irritation, and possibly dangerous inflammation. The common and absurd practice is to give the horse most exercise after the physic has begun to operate.

A little hay may be put into the rack; as much mash may be given as the horse will eat, and as much water, with the coldness of it taken off, as he will drink. If, however, he obstinately refuses to drink warm water, it is better that he should have it cold, than to continue without taking any fluid; but he should not be suffered to take more than a quart at a time, with an interval of at least an hour between each portion.

When the purging has ceased, or *the physic is set*, a mash should be given once or twice every day until the next dose is taken, between which and the *setting* of the first there should be an interval of a week. The horse should recover from the languor and debility occasioned by the first dose, before he is harassed by a second.

Eight or ten tolerably copious motions will be perfectly sufficient to answer every good purpose, although the groom or the carter may not be satisfied unless double the quantity are procured. The consequence of too strong purgation will be, that a lowness and weakness will hang about the horse for many days or weeks, and inflammation will often ensue from the over-irritation of the intestinal canal.

Long continued custom has made ALOES the almost invariable purgative of the horse, and very properly so; for there is no other at once so sure and safe. The Barbadoes aloes, although sometimes very dear, should alone be used. The dose, with a horse properly prepared, will vary from five to seven drachms. The preposterous doses of nine, ten, or even twelve drachms are, happily for the horse, generally abandoned. Custom has assigned the form of a ball to physic, but good sense will in due time introduce the solution of aloes, as acting more speedily, effectually, and safely.

The only other purgative on which dependence can be placed is the CROTON. The farina or meal of the nut is used; but from its acrimony it should be given in the form of ball, with linseed meal. The dose varies from a scruple to half a drachm. It acts more speedily than the aloes, without the nausea which they produce; but it causes more watery stools, and consequently more debility.

Linseed oil is an uncertain but safe purgative, in doses from a pound to a pound and a half. Olive oil is more uncertain but safe; and castor oil, that mild aperient in the human being, is both uncertain and unsafe. Epsom salts are inefficacious, except in immense doses of a pound and a half, and then not always safe.

The horse, and particularly the perfect horse, is occasionally subject to

HERNIA OR RUPTURE.

A portion of the intestine protrudes out of the cavity of the belly either through some natural or artificial opening. In some cases it may be returned, but from the impossibility of applying a truss or bandage it soon returns again. At other times the opening is so narrow, that the gut, gradually distended by fæces, or thickened by inflammation, cannot be returned, and *strangulated* hernia is then said to exist. The seat of hernia is either in the scrotum of the perfect horse, or the groin of the gelding. The causes are violent struggling when under operations, over-exertion, kicks, or accidents. The assistance of a veterinary surgeon is here indispensable.

THE LIVER.

Between the stomach and the diaphragm, its right lobe or division in contact with the diaphragm, the duodenum and the right kidney, and the middle and left divisions with the stomach, is the liver. It is an irregularly shaped, reddish-brown substance of considerable bulk, and performs a very singular and important office.

We have already stated (p. 176) that the blood, which has been conveyed to the different parts of the body by the arteries, is carried back to the heart by the veins; but that which is returned from the stomach and intestines, and spleen, and pancreas, and mesentery, instead of flowing directly to the heart, passes first through the liver. It enters by two large vessels which spread by means of innumerable minute branches through every part of the liver. As the blood traverses this organ, a fluid is separated from it, called the *bile*. This is probably a kind of excrement, the continuance of which in the blood would be injurious; but while this is thrown off, another important purpose is answered; the process of digestion is promoted, and particularly by the bile changing the nutritive part of the food from chyme into chyle, and separating it from that which, containing little or no nutriment, is voided as excrement.

The bile, thus formed, is in most animals received into a reservoir, the *gall-bladder*, whence it is conveyed into the duodenum (*g*, p. 202) at the times, and in the quantities, which the purposes of digestion require; but the horse has no gall-bladder, and, consequently, the bile flows into the intestine as fast as it is separated from the blood. The reason of this is plain; a small stomach was given to the horse, that the food might quickly pass out of it, and the diaphragm and the lungs might not be injuriously pressed upon, when we require his utmost speed; and that we might use him with little danger compared with that which would attach to other animals, even when his stomach is distended with food. Then the stomach, so small, and so speedily emptied, must be oftener replenished; the horse must be oftener eating, and food must be oftener passing out of his stomach; and, consequently, there is no necessity for this reservoir. The ox occupies a long time in filling his paunch, and it is only during rumination that the food passes into the true stomach to be digested. The meal of the dog is speedily swallowed. They need a gall-bladder to contain the bile, which continues to be secreted when it cannot be used: but to the horse, so frequently eating, it would be useless.

INFLAMMATION OF THE LIVER

Is a disease of rare occurrence in the horse. He is not exposed to the causes which produce that complaint in other animals. Although his food is sometimes highly nutritive, the work which is exacted from him prevents it from unduly stimulating this important organ; and when inflammation of the liver does occur, it is with so much difficulty distinguished from that of the bowels, that if yellowness of the eyes and skin are not present, even the professional man is liable to be deceived.

Bleeding from, or RUPTURE OF THE LIVER, is another disease of *old horses*, and especially of those that have been highly fed. It is generally fatal, but of unfrequent occurrence; it is recognised by the frequent and feeble pulse, the pawing and sighing of the animal, the coldness of the extremities, whiteness of the eye and mouth, fulness of the belly, and speedy debility. A veterinary surgeon is alone competent to give assistance here.

JAUNDICE,

Commonly called THE YELLOWS, is a more tractable disease, and a little more frequent. It is the introduction of bile into the general circulation, and which is usually caused by some obstruction in the ducts or tubes which convey the bile from the liver to the intestines. The horse, however, has but one duct, through which the bile usually flows as quickly as it is formed, and there is no gall-bladder in which it can become thickened, and even hardened into masses so hard as to be very appropriately called *gall-stones*. Jaundice does, however, occasionally appear either from an increased flow or altered quality of the bile, or obstruction even in this simple tube. The yellowness of the eyes and mouth, and of the skin where it is not covered with hair, mark it sufficiently plainly. The dung is small and hard; the urine high coloured; the horse languid, and the appetite impaired.

It is first necessary to inquire whether this affection of the liver be not the consequence of the sympathy of this organ with some other part; for, to a very considerable degree, it frequently accompanies inflammation of the bowels and the lungs. These diseases being subdued, jaundice will disappear. If there be no other disease to any great extent, we must endeavour to restore the natural passage of the bile by purgatives, not consisting of large doses, lest there should be some undetected inflammation of the lungs or bowels, in either of which a strong purgative would be dangerous; but given in small quantities, repeated at short intervals, and until the bowels are freely opened. Two drachms of aloes, and one of calomel, given twice every day, will be as much as can at all times be administered with safety. Bleeding should always be resorted to, regulated according to the apparent degree of inflammation, and the occasional stupor of the animal. Plenty of water slightly warmed, or thin gruel, should be given; the horse should be warmly clothed, and the stable well ventilated, but not cold. Carrots or green meat will be very beneficial. Should the purging, when once excited, prove violent, we should be in no haste to stop it, unless inflammation is beginning to be connected with it, or the horse is very weak. The medicine recommended under diarrhœa may then be exhibited. A few slight tonics should be given when the horse is recovering from an attack of strangles. Two drachms each of gentian and chamomile, with one of ginger, will form a useful ball.

THE SPLEEN.

This organ, known commonly by the name of the *melt*, is a long, bluish-brown substance, broad and thick at one end and tapering at the other, lying along the left side of the stomach, and between it and the short ribs. It is of a spongy nature, divided into numerous little cells not unlike a honey comb, and over which thousands of minute vessels thickly spread. The particular use of this body has never been clearly ascertained; for in some cruel experiments it has been removed without apparent injury to digestion, or any other function. It is, however, useful, at least occasionally, or it would not have been given. It is perhaps a reservoir or receptacle for any fluid that may be conveyed into the stomach more than is sufficient for the purposes of digestion.

The spleen is sometimes very extraordinarily enlarged, and has been ruptured; but we are not aware of any symptoms by which this can be discovered.

THE PANCREAS.

In the domestic animals which are used for food, this organ is called the *sweetbread.* It lies between the stomach and left kidney. It much resembles in structure the salivary glands in the neighbourhood of the mouth, and the fluid which it secretes is very like common saliva. The pancreatic fluid is carried into the intestines by a duct which enters at the same aperture with that from the liver. Its use, whether to dilute the bile, or the chyme, or to assist in the separation of chyme from the feculent matter, has never been ascertained, but it is clearly employed in aiding the process of digestion.

We know not of any disease to which the pancreas of the horse is liable.

As soon as the belly of most of our domestic animals is opened, a membrane is perceived spreading over all the contents of this cavity; it is denominated

THE OMENTUM,

Or *cawl.* It is a doubling of the peritoneum, or rather consists of four layers of it. It has been supposed to be placed between the intestines and the walls of the belly, to prevent concussion and injury during the rapid movement of the animal. That, however, cannot be its principal use in the horse, from whom the most rapid movements are required; for in him it is unusually short, extending only to the pancreas, and a small portion of the colon. Being, however, thus short, the horse is exempt from a very troublesome and, occasionally, fatal species of rupture, when a portion of the omentum penetrates through some accidental opening in the covering of the belly.

The blood contains a great quantity of watery fluid unnecessary for the nutriment or repair of the frame. There likewise mingle with it matters which would be noxious if suffered to accumulate too much.

THE KIDNEYS

are actively employed in separating this water, and likewise carrying off a substance which constitutes the peculiar ingredient in urine, called the *urea,* and consists principally of that which would be poisonous to the animal. The kidneys are two large glandular bodies, placed under the loins, very much of the shape of a kidney bean. The right kidney is most forward, lying under the liver; the left is pushed more backward by the stomach and spleen. A large artery runs to each, carrying not less than a sixth part of the whole of the blood that circulates through the frame. The artery divides into innumerable little branches most curiously complicated and coiled upon each other; and the blood, traversing these convolutions, has its watery parts and others the retaining of which would be injurious, separated from it.

The fluid thus separated varies materially both in quantity and composition, even during health. There is no animal in which it varies so much as in the horse. There is no organ in that animal so much under our command as the kidney; and no medicines are so useful, or may be so injurious, as diuretics. In speaking of fever and inflammation of the lungs, and indeed inflammation generally, we have recommended the use of nitre and digitalis, not only on account of their febrifuge or sedative effects, but because they act as diuretics. They stimulate the kidneys to separate more aqueous fluid than they otherwise would do, and thus lessen the quantity of blood; the quantity which the heart is labouring to circulate through the frame, and the quantity which is determined or driven to a part already overloaded. The main objects we have to accomplish in these diseases is to reduce the force of the circulation, and to calm the violence of excitement; and diuretics, by lessening the quantity of blood, are useful assistants in accomplishing these purposes. It is, however, in the varieties of dropsy that their benefit is most evident. The horse is more subject to effusions of fluid in particular parts than any other domestic animal. Swelled legs is a disease peculiar to him. The ox, the sheep, the dog, the ass, and even the mule, have it very seldom; and for the removal of this deposit of fluid in the cellular substance of the legs we have recourse to diuretics. The kidneys are stimulated to separate more than the usual quantity of water from the blood. In order to make up this deficiency in quantity, the absorbents set to work, and they take up and pour into the circulation the fluid which had been effused in the legs. The legs of many horses cannot be rendered fine, or kept so, without the use of diuretics; nor can grease, often connected with these swellings, producing them or caused by them, be otherwise subdued. We therefore rank diuretics among the most useful of the veterinary medicines.

In injudicious hands, however, these medicines are sadly abused. Among the absurdities of stable management there is nothing so injurious as the frequent use of diuretics. Not only are the kidneys, so often over-excited, weakened, disposed to disease, but the whole frame becomes debilitated, for the absorbents have carried away a great part of that which was necessary to the health and condition of the horse, in order to supply the deficiency of blood occasioned by the inordinate discharge of urine. There is likewise one important fact of which the groom or the horseman seldom thinks; that when he is removing these humours by the imprudent use of diuretics, he is only attacking a symptom or a consequence of disease, and not the disease itself. The legs will fill again, and the grease will return. While the cause remains, the effect will be produced. We shall say more of this when we treat particularly of these diseases of the extremities.

In the administration of diuretics there are two things to be chiefly attended to. The first is that which seems to be contradictory, but the good effect of which the testimony of every intelligent man will confirm—*let the horse have plenty to drink.* Not only will inflammation be prevented, but the operation of the medicine will be much promoted. If more water than usual be drunk, a great deal more will be evacuated. The next caution is, that during the administration of a diuretic neither the clothing nor the stable should be too warm, otherwise that which was intended to stimulate the kidney will pass off by perspiration; for it seems to be a law of the frame, that what increases the discharge from the skin proportionably lessens the action of the kidneys.

The best diuretic, and which given simply to promote an increased secretion from the kidneys, supersedes every other, is turpentine; either the common liquid turpentine in doses of half an ounce, and made into a ball with linseed meal, and half a drachm of ginger; or, what is better, the same quantity of powdered resin, with two drachms of linseed meal, and half a drachm of ginger, formed into a mass with palm-oil. In cases of inflammation or fever, nitre or digitalis should be used. The spirit of nitrous ether, cream of tartar, and balsam of capivi have some diuretic effect.

INFLAMMATION OF THE KIDNEY

Is no uncommon disease in the horse, and is more unskilfully and fatally treated than almost any other. The early symptoms are those of fever generally, but the seat of the disease soon becomes evident. The horse looks anxiously round at his flanks; stands with his hinder legs wide apart; straddles as he walks; expresses pain in turning; shrinks when the loins are pressed, and some degree of heat is felt there. The urine is voided in small quantities, and frequently it is high-coloured, and sometimes bloody. The attempt to urinate becomes more frequent, and the quantity voided smaller; until the animal strains painfully and violently, but the discharge is nearly or quite suppressed. The pulse is quick and hard; full in the early stage of the disease, but rapidly becoming small, yet not losing its character of hardness. These symptoms clearly indicate an affection of the urinary organs; but they do not distinguish inflammation of the kidney from that of the bladder. The hand must be introduced into the rectum. If the bladder be felt full and hard under the rectum, there is inflammation of the neck of the bladder: if the bladder be empty, yet on the portion of the intestines immediately over it there is more than natural heat and tenderness, there is inflammation of the body of the bladder; but if the bladder be empty, and there is no increased heat or tenderness, there is inflammation of the kidney.

Among the causes are improper food. There is no more frequent cause than hay that has been mow-burnt, or oats that are musty. The farmer should look well to this. Oats that have been dried on the kiln acquire a diuretic property, and if horses are long fed on them, the continual excitement of this organ which they produce will degenerate into inflammation. Too powerful, or too-often-repeated diuretics produce inflammation of the kidney; or a degree of irritation and weakness of that organ, that disposes to inflammation from causes that would otherwise have no injurious effect. If a horse is sprained in the loins, by being urged on, far or fast, by a heavy rider, or by being suddenly pulled up on his haunches, the inflammation of the muscles of the loins is often speedily transferred to the kidneys, with which they lie in contact. Exposure to cold is another frequent origin of this malady, especially if the horse be drenched with rain, or the wet drips upon his loins; and more particularly, if he were previously disposed to inflammation, or these organs had been previously weakened. For this reason, hackney-coach horses and others, exposed to the vicissitudes of the weather, and often fed on unwholesome provender, have, or should have, their loins protected by a leather or a cloth.

The treatment will only vary from that of inflammation of other parts, by the consideration of the peculiarity of the organ affected. Bleeding must be promptly resorted to, and carried to its full extent. An active purge should next be administered; and a counter-inflammation excited as near as possible to the seat of disease. For this purpose, the loins should be fomented with hot water, or covered with a mustard poultice; but no cantharides or turpentine must be used, and, most of all, must no diuretic be given internally. When the groom finds this difficulty or suppression of staling, he immediately has recourse to a diuretic ball, to force on the urine; and by thus farther irritating a part already too much excited, he adds fuel to fire, and frequently destroys the horse. When the action of the purgative begins a little to cease, white hellebore may be administered, in doses of a scruple three times a day, with or without emetic tartar. The horse should be warmly clothed; his legs well bandaged, and plenty of water offered to him. The food should be carefully examined, and anything that could have excited, or that may prolong the irritation, carefully removed.

DIABETES, OR PROFUSE STALING,

Is a comparatively rare disease. It is the consequence, generally, of undue irritation of the kidney, by bad food or strong diuretics; and sometimes follows inflammation of the kidney. It can seldom be traced in the horse to any disease of the digestive organs. The treatment is obscure, and the result often uncertain. It is, evidently, increased action of the kidney, and therefore the most rational plan of treatment is to endeavour to abate that action; and nearly the same course should be pursued in the early stage of diabetes, as in actual inflammation; but the lowering system should not be carried to so great an extent. To bleeding, purging, and counter-irritation, medicines of an astringent quality should succeed, as catechu, the powdered leaf of the wortle-berry (uva ursi), and opium, in doses of two drachms each of the two first, and half a drachm of the last. Very careful attention should be paid to the food. The hay and oats should be of the best quality; and green meat, and especially carrots, will be very serviceable.

THE BLADDER.

The urine separated by the blood is discharged by the minute vessels, of which we have spoken, into some larger canals, which terminate in a cavity or reservoir in the body of the kidney, called its *pelvis;* and thence is conveyed by a duct, called the *ureter*, to a larger reservoir, the *bladder*. It is constantly flowing from the kidney through the ureter; and were there not this provision for its detention, it would be incessantly and annoyingly dribbling from the animal. The bladder lies in, and, when distended by urine, nearly fills, the cavity of the great bones of the haunch, termed the pelvis. It has three coats—the outer one covering the greater part of it, and being a portion of the peritoneum; the muscular, consisting of two layers of fibres, as in the stomach; the external, running longitudinally, and the inner circularly, so that it may yield to the pressure of the urine as it enters, and contract again into an exceedingly small space as it runs out, and by that contraction assist in the expulsion of the urine. The inner or mucous coat contains numerous little glands which pour out a mucous fluid to defend the bladder from the acrimony of the urine. The bladder terminates in a small neck, round which is a strong muscle, keeping the passage closed, and retaining the urine until, at the will of the animal, or when the bladder contains a certain quantity of fluid, the muscular coat begins to contract, and, the lungs being filled with air, the diaphragm is rendered convex towards the intestines, and presses then on the bladder, and by these united powers, the fluid is forced through the sphincter muscle at the neck of the bladder, and escapes.

INFLAMMATION OF THE BLADDER.

There are two varieties of this disease, inflammation of the body of the bladder, and of its neck. The symptoms are nearly the same with those of inflammation of the kidney, except that there is rarely a total suppression of urine, and there is heat felt in the rectum over the situation of the bladder. The causes are the presence of some acrid or irritant matter in the urine, or of calculus or stone in the bladder. With reference to inflammation of the body of the bladder, mischief has occasionally been done by the introduction of cantharides or some other irritating matter to hasten the period of horsing in the mare. The treatment will be the same as in inflammation of the kidney, except that it is of more consequence that the horse should drink freely of water or thin gruel, and that gruel or mucilage of any kind may, by one who understands the anatomy of the animal, be easily introduced into the bladder of the mare.

In inflammation of the neck of the bladder there is the same frequent voiding of urine in small quantities, generally appearing in an advanced stage of the disease, and often ending in almost total suppression. There is also this circumstance, which can never be mistaken by him who will pay diligent attention to the case, that the bladder is distended with urine, and may be distinctly felt under the rectum. It is spasm of the part, closing the neck of the bladder so powerfully, that the contraction of the bladder, and the pressure of the muscles, are unable to force out the urine.

Here the object to be attempted is sufficiently plain. This spasm must be relaxed. The most likely means to effect this is to bleed largely, and even to fainting. This will sometimes succeed, and there will be at once an end to the disease. To the exhaustion and loss of muscular power occasioned by copious bleeding, should be added the nausea consequent on physic. Should not this speedily have effect, another mode of abating spasm must be tried. A drachm of the powdered opium, made into a ball or drink, may be given every two or three hours; while an active blister is applied externally. In the mare the bladder may be easily evacuated by means of a catheter in skilful hands; but owing to the curved direction of the penis, a catheter cannot be introduced into the bladder of a horse, without an operation to which a veterinary surgeon alone is competent.

STONE IN THE BLADDER.

The urine is a very compound fluid; in a state of health it contains a great many acids and alkalies variously combined, which under disease are increased both in number and quantity. It is very easy to conceive that some of these shall be occasionally separated from the rest, and assume a solid form both in the pelvis of the kidney, and in the bladder. This is known to be the case both in the human being and the brute. These calculi or stones are in the horse found oftener in the kidney than in the bladder, contrary to the experience of the human surgeon. The explanation of this, however, is not difficult. In the human being the kidney is situated above the bladder, and these concretions descend from the kidney to the bladder by their weight. The belly of the horse is horizontal, and the force of gravity can in no way affect the passage of the calculus; therefore it remains in the pelvis of the kidney, until it increases so much in size as often to fill it. We know not of any symptoms which would satisfactorily indicate the presence of a stone in the kidney; and if the disease could be ascertained, we are unable to say what remedial measures could be adopted.

The symptoms of stone in the bladder much resemble those of spasmodic colic, except that on careful inquiry it will be found that there has been much irregularity in the discharge of urine, and occasional suppression of it. When fits of apparent colic frequently return, and are accompanied by any peculiarity in the discharge of urine, the horse should be carefully examined. He should be thrown. If there be stone in the bladder, it will, while the horse lies on its back, press on the rectum, and may be distinctly felt if the hand be introduced into the rectum. Several cases have lately occurred of successful extraction of the calculus; but here it will be necessary to have recourse to the aid of a veterinary practitioner.

Many horses occasionally void a considerable quantity of gravel, sometimes without inconvenience, at others with evident spasm or pain. A diuretic might here be useful, as increasing the flow of urine, and possibly washing out the concretions before they become too numerous or bulky.

The urine having passed the neck of the bladder, flows along the urethra, and is discharged. The sheath of the penis is sometimes considerably enlarged. When at the close of acute diseases, there are swellings and effusions of fluid, under the chest and belly, this part seldom escapes. Diuretics, mixed with a small portion of cordial medicine, will be beneficial, although in some extreme cases slight scarifications may be necessary. The inside of the sheath is often the seat of disease; the mucous matter naturally secreted there to defend the part from the acrimony of the urine, accumulates and becomes exceedingly offensive, and produces swelling, tenderness, and even excoriation, and sometimes considerable discharge. A little fomentation with warm water, and the cleansing of the part with soap and water, aided perhaps by a diuretic ball, will speedily remove every inconvenience. Carters are much too apt to neglect cleanliness in this respect.

Chapter XII.

BREEDING, CASTRATION, &c.

This may be a proper period to recur to the important subject of breeding, particularly important when there cannot be a doubt that our breed of useful horses has, within the last twenty years, most materially degenerated. Our running-horses still maintain their supremacy; our carriage-horses are not much lessened in excellence and value; but our hunters and hackneys are not what they used to be. We shall endeavour to point out the cause of this.

Our observations must be of a general nature, and will be very simple; and the first axiom we would lay down is, that "like will produce like," that the progeny will inherit the qualities, or the mingled qualities, of the parents. We would refer to the subject of diseases, and again state our perfect conviction, that there is scarcely one by which either of the parents is affected, that the foal will not inherit, or, at least, the predisposition to it: even the consequences of ill usage or hard work will descend to the progeny. We have already enlarged on this, but its importance will be a sufficient apology for the repetition. We have had proof upon proof, that blindness, roaring, thick wind, broken wind, spavins, curbs, ringbones, and founder, have been bequeathed, both by the sire and the dam, to the offspring. It should likewise be recollected, that although these blemishes may not appear in the immediate progeny, they frequently will in the next generation. Hence the necessity of some knowledge of the parentage both of the sire and dam.

Peculiarity of form and constitution will also be inherited. This is a most important, but neglected consideration; for however desirable, or even perfect, may have been the conformation of the sire, every good point may be neutralized or lost by the defective form, or want of blood, of the mare. There are niceties in this, of which some breeders used to be aware, and they employed their knowledge to great advantage. When they were careful that the essential points should be good in both parents, and that some minor defect in either should be met, and got rid of, by excellence in that particular point in the other, the result was creditable to their judgment, and highly profitable. The unskilful or careless breeder will often so badly pair the animals, that the good points of each will be, in a manner, lost: the defects of both will be increased, and the produce will be far inferior to both sire and dam.

Of late years, these principles have been much lost sight of in the breeding of horses for general use; and the following is the explanation of it. There are nearly as good stallions as there used to be. Few but well-formed and valuable horses will be selected and retained as stallions. They are always the very prime of the breed; but the mares are not what they used to be. Poverty has induced many of the breeders to part with the mares from which they used to raise their stock, and which were worth their weight in gold; and the jade on which the farmer now rides to market, or which he uses in his farm, costs him but little money, and is only retained because he could not get much money for her. It has likewise become the fashion for gentlemen to ride mares, almost as frequently as geldings; and thus the better kind are taken from the breeding service, until old age or injury renders them worth little for it. An intelligent veterinary surgeon, Mr. Castley, has placed this in a very strong light, in the third volume of the "Veterinarian," p. 371.

We would wish, then, to impress it on the minds of breeders, that peculiarity of form and constitution are inherited from both parents; that the excellence of the mare is a point of quite as much importance as that of the horse; and that out of a sorry mare, let the horse be as perfect as he may, a good foal will rarely be produced. All this is recognised upon the turf, although poverty or carelessness have made the general breeder neglect or forget it.

It is recognised in the midland counties in the breed of cart-horses; and the strict attention which has been paid to it, has brought our heavy horses to almost the same perfection in their way as the blood-horse. It is strange that in our saddle-horses, our hunters, and, to a great degree, our carriage-horses, this should be left to chance. The breeder begins to care little about the quality of the mare, and the progeny is becoming comparatively of little worth. Experience, it is said, will make fools wise, but experience will here be bought at a very dear rate, both as it regards the breeder and the community.

That the constitution and endurance of the horse are inherited, no sporting man ever doubted. The qualities of the sire or the dam descend from generation to generation, and the excellences or defects of certain horses are traced, and justly so, to some peculiarity in a far distant ancestor.

It may, perhaps, be justly affirmed, that there is more difficulty in selecting a good mare to breed from, than a good horse, because she should possess somewhat opposite qualities. Her carcase should be long, to give room for the growth of the fœtus, and yet with this there should be compactness of form and shortness of leg. What can they expect who go to Smithfield Market to purchase a number of worn-out, spavined, foundered mares, about whom they fancy there have been some good points, and send them far into the country to breed from, and, with all their variety of shape, to be covered by the same horse? In a lottery like this, there may be now and then a prize, but there must be many blanks. "If horse-breeders, possessed of good judgment, would pay the same attention to breed and shape as Mr. Bakewell did with sheep, they would probably attain their wishes in an equal degree, and greatly to their advantage, whether for the collar or the road, for racing or for hunting*."

As to the shape of the stallion, little satisfactory can be said. It must depend on that of the mare, and the kind of horse wished to be bred; but if there be one point which we should say is absolutely essential, it is this, "compactness"—as much goodness and strength as possible condensed in a little space. If we are describing the reverse of the common race of stallions for hunters and coach-horses, the fault lies with the bad taste and judgment of the majority of breeders.

Next to compactness, the inclination of the shoulder will be regarded. A huge stallion, with upright shoulders, never got a capital hunter or hackney. From him the breeder can obtain nothing but a cart or dray-horse, and that, perhaps, spoiled by the opposite form of the mare. On the other hand, an upright shoulder is desirable, if not absolutely necessary, when a mere draught horse is required.

It is of no little importance, that the parents should be in full possession of their natural strength and powers. It is a common error, that because a mare has once been good, she is fit for breeding when she is no longer capable of ordinary work. Her blood and perfect frame may ensure a foal of some value, but he will inherit a portion of the worn-out constitution of her from whom he sprung.

On the subject of *breeding in and in*, that is, persevering in the same breed, and selecting the best on either side, much has been said. The system of crossing requires much judgment and experience; a great deal more, indeed, than breeders usually possess. The bad qualities of the cross are too soon engrafted on the original stock, and once engrafted there, are not, for many generations, eradicated. The good ones of both are occasionally neutralized to a most mortifying degree. On the other hand, it is the fact, however some may deny it, that strict confinement to one breed, however valuable or perfect, produces gradual deterioration. The truth here, as in many other cases, lies in the middle; crossing should be attempted with great caution, and the most perfect of the same *breed* should be selected, but varied, by being frequently taken from different stocks. This is the secret of the course. The pure south-eastern blood is never left, but the stock is often changed with manifest advantage.

A mare is capable of breeding at three or four years old; some have injudiciously commenced at two years, before her form or her strength is sufficiently developed, and with the developement of which this early breeding will materially interfere. If she does little more than farm-work, she may continue to be bred from until she is nearly twenty; but if she has been hardly worked, and bears the marks of it, let her have been what she will in her youth, she will deceive the expectations of the breeder in her old age.

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* Parkinson on the Breeding and Management of Live Stock, vol. ii., p. 59.

The mare comes into heat in the early part of the spring. She is said to go with foal eleven months, but there is sometimes a strange irregularity about this. Some have been known to foal five weeks earlier, while the time of others has been extended six weeks beyond the eleven months. We may, however, take eleven months as the average time. In running-horses, that are brought so early to the starting-post, and whether they are foaled early in January or late in April, rank as of the same age, it is of importance that the mare should go to cover as early as possible: in a two or three-year-old, four months would make considerable difference in the growth and strength; yet many of these early foals are almost worthless, because they have been deprived of that additional nutriment which nature designed for them. For other breeds, the beginning of May is the most convenient period. The mare would then foal in the early part of April, when there would begin to be sufficient food for her and her colt, without confining them to the stable.

From the time of covering to that of foaling, the mare may be kept at moderate work, and that not only without injury, but with decided advantage. The work may be continued up to the very time when she is expected to foal; and of which she will give at least a day's notice, by the adhesive matter that will appear about the teats. When this is seen, it will be prudent to release her from work, and keep her near home, and under the frequent inspection of some careful person.

When nearly half the time of pregnancy has elapsed, the mare should have a little better food. She should be allowed one or two feeds of corn in the day. This is about the period when they are accustomed to slink their foals, or when abortion occurs: at this time, therefore, the eye of the owner should be frequently upon them. Good feeding and moderate exercise will be the best preventives against this. The mare that has once slinked her foal is ever liable to the same accident, and therefore should never be suffered to be with other mares about the time that this usually occurs, which is between the fourth and fifth months; for such is the power of imagination or of sympathy in the mare, that if one of them suffers abortion, the greater number of those in the same pasture will share the same fate. Farmers wash, and paint, and tar their stables to prevent some supposed infection :—the infection lies in the imagination.

If a mare has been regularly exercised, and apparently in health while she was in foal, little danger will attend the act of parturition. If there be false presentation of the fœtus, or difficulty in producing it, it will be better to have recourse to a well-informed practitioner, rather than injure the mother by the violent, and injurious attempts which are often made to relieve the animal.

As soon as the mare has foaled, she should be turned into some well-sheltered pasture, with a hovel or shed to run into when she pleases: and as, supposing she has foaled in April, the grass is scanty, she should have a couple of feeds of corn daily. The breeder may depend upon it, that nothing is gained by starving the mother and stinting the foal at this time. It is the most important time in the life of the horse; and if, from false economy, his growth be arrested now, his puny form and want of endurance will ever afterwards testify the error that has been committed. The corn should be given in a trough on the ground, that the foal may partake of it with the mother. When the new grass is flush and plenty, the corn may be gradually discontinued.

Our work is intended, principally, for farmers: they well know that the mare may be put to moderate work again a month after the foaling. The foal is at first shut in the stable during the hours of work; but as soon as it acquires sufficient strength to toddle after the mare, and especially when she is at slow work, it will be better for the foal and the dam that they should be together. The work will contribute to the health of the mother; the foal will more frequently draw the milk, and thrive better; and will be hardy and tractable, and gradually familiarized with the objects among which it is afterwards to live. While the mother, however, is thus worked, she and the foal should be well fed; and two feeds of corn, at least, should be added to the green food which they get when turned out after their work, and at night. The mare will usually be found at heat at or before the expiration of a month from the time of foaling, when, if she be kept principally for breeding purposes, she may be put again to the horse.

In five or six months, according to the growth of the foal, it may be weaned. It should then be housed for three weeks or a month, or turned into some distant rick-yard. There can be no better place for the foal than the latter, as affording, and that without trouble, both food and shelter. The mother should be put to harder work, and have drier meat. One or two urine balls, or a physic ball, will be useful if the milk should be troublesome, or she should pine after her foal.

There is no principle of greater importance than the liberal feeding of the foal during the whole of his growth, and at this time in particular. Bruised oats and bran should form a considerable part of his daily provender. The farmer may be assured that money is well laid out which is expended on the liberal nourishment of the growing colt: while, however, he is well fed, he should not be rendered delicate by excess of care. A racing colt is sometimes stabled; but one that is destined to be a hunter, a hackney, or an agricultural horse, should merely have a square rick, under the leeward side of which he may shelter himself, or a hovel, into which he may run at night, or out of the rain. The process of breaking-in should commence from the very period of weaning. The foal should be daily handled, partially dressed, accustomed to the halter, led about, and even tied up. The tractability, and good temper, and value of the horse, depend a great deal more upon this than breeders are aware: this should be done as much as possible by the man by whom they are fed, and whose management of them should be always kind and gentle. There is no fault for which a breeder should so invariably discharge his servant as cruelty, or even harshness, towards the rising stock; for the principle on which their after usefulness is founded, is early attachment to, and confidence in man, and obedience, implicit obedience, resulting principally from these.

After the second winter, the work of breaking-in may commence in good earnest. He may first be bitted, and a bit carefully selected that will not hurt his mouth, and much smaller than those in common use; with this he may be suffered to amuse himself, and to play, and to champ for an hour, on a few successive days.

Having become a little tractable, portions of the harness may be put upon him, and, last of all, the blind winkers; and a few days afterwards he may go into the team. It would be better if there could be one before, and one behind him, beside the shaft horse. Let there be first the mere empty waggon. Let nothing be done to him, except that he may have an occasional pat or kind word. The other horses will keep him moving, and in his place; and no great time will pass, sometimes not even the first day, before he will begin to pull with the rest: then the load may be gradually increased.

The agricultural horse is wanted to ride as well as to draw. Let his first lesson be given when he is in the team. Let his feeder, if possible, be first put upon him: he will be too much hampered by his harness, and by the other horses, to make much resistance; and, in the majority of cases, will quietly and at once submit. We need not repeat, that no whip or spur should be used in giving the first lessons in riding.

When he begins a little to understand his business, backing, the most difficult part of his work, may be taught him; first to back well without anything behind him, then with a light cart, and afterwards with some serious load; and taking the greatest care not seriously to hurt the mouth. If the first lesson causes much soreness of the gums, the colt will not readily submit to a second. If he has been rendered tractable before by kind usage, time and patience will do all that can be wished here. Some carters are in the habit of blinding the colt when teaching him to back: it may be necessary with the restive and obstinate one, and should be used only as a last resort.

The colt having been thus partially broken-in, the necessity of implicit obedience may be taught him, and that not by severity, but by firmness and steadiness; the voice will go a great way, but the whip or the spur is sometimes indispensable—not so cruelly applied as to excite the animal to resistance, but to convince him that we have the power to enforce submission. Few, we would almost say, no horses, are naturally vicious. It is cruel usage which has first provoked resistance; that resistance has been followed by greater severity, and the stubbornness of the animal has increased; open warfare has ensued, in which the man seldom gained an advantage, and the horse was frequently rendered unserviceable. Correction may, or must be used, to enforce implicit obedience after the education has proceeded to a certain extent, but the early lessons should be inculcated with kindness alone. Young colts are sometimes very perverse; many days will occasionally pass before they will permit the bridle to be put on, or the saddle to be worn; one act of harshness will double or treble this time. Patience and kindness will, after a while, prevail. On some morning, of better humour than usual, the bridle will be put on, and the saddle will be worn; and this compliance being followed by kindness and soothing on the part of the breaker, and no inconvenience or pain being suffered by the animal, all resistance will be at an end.

The same principles will apply to the breaking-in of the horse for the road or the chase. The handling, and some portion of instruction, should commence from the time of weaning. The future tractability of the horse will much depend on this. At two years and a half, or three years, the regular process of breaking-in should come on. If it be delayed until the animal is four years old, his strength and obstinacy will be more difficult to overcome. We cannot much improve on the plan usually pursued by the breaker, except that there should be much more kindness and patience, and far less harshness and cruelty, than these persons are accustomed to exhibit, and a great deal more attention to the form and natural action of the horse. A headstall is put on the colt, and a cavesson (or apparatus to confine and pinch the nose) affixed to it, with long reins. He is first accustomed to the rein, then led round a ring on soft ground, and at length mounted and taught his paces. Next to preserving the temper and docility of the horse, there is nothing of so much importance as to teach him every pace, and every part of his duty, distinctly and thoroughly. Each must constitute a separate and sometimes long-continued lesson, and that taught by a man who will never suffer his passion to get the better of his discretion.

After the cavesson has been attached to the headstall, and the long rein put on, the first lesson is, to be quietly led about by the breaker; a steady boy following behind, by occasional threatening with the whip, but never by an actual blow, to keep the colt up. When the animal follows readily and quietly, he may be taken to the ring, and walked round, right and left, in a very small circle. Care should be taken to teach him this pace thoroughly, never suffering him to break into a trot. The boy with his whip may here again be necessary, but not a single blow should actually fall.

Becoming tolerably perfect in the walk, he should be quickened to a trot, and kept steadily at it; the whip of the boy, if needful, urging him on, and the cavesson restraining him. These lessons should be short. The pace should be kept perfect and distinct in each; and docility and improvement rewarded with frequent caresses, and handfuls of corn. The length of the rein may now be gradually increased, and the pace quickened, and the time extended, until the animal becomes tractable in this his first lessons, towards the conclusion of which, crupper-straps, or something similar, may be attached to the clothing. These, playing about the sides and flanks, accustom him to the flapping of the coat of the rider. The annoyance which they occasion will pass over in a day or two; for when the animal finds that no harm comes to him on account of these straps, he will cease to regard them.

Next comes the bitting. The bit should be large and smooth, and the reins should be buckled to a ring on either side of the pad. There are many curious and expensive machines for this purpose, but the simple rein will be quite sufficient. The reins should at first be slack, and very gradually tightened. This will prepare for the more perfect manner in which the head will be afterwards got into its proper position, when the colt is accustomed to the saddle. Occasionally the breaker should stand in front of the colt, and take hold of each side rein near to the mouth, and press upon it, and thus begin to teach him to stop and to back at the pressure of the rein, rewarding every act of docility, and not being too eager to punish occasional carelessness or waywardness.

The colt may now be taken into the road or street to be gradually accustomed to the objects among which his services will be required. Here, from fear or playfulness, a considerable degree of starting and shying may be exhibited. As little notice as possible should be taken of it. The same or a similar object should be soon passed again, but at a greater distance. If the colt still shies, let the distance be farther increased, until he takes no notice of the object; then he may be gradually brought nearer to it, and this will be usually effected without the slightest difficulty: whereas, had there been an attempt to force the animal close to it in the first instance, the remembrance of the contest would have been associated with the object, and the habit of shying would have been established.

Hitherto, with a cool and patient breaker, the whip may have been shown, but will scarcely have been used; the colt must now, however, be accustomed to this necessary instrument of authority. Let the breaker walk by the side of the animal, and throw his right arm over his back, holding the reins in his left; and occasionally quicken his pace, and, at the moment of doing this, tap the horse with the whip in his right hand, and at first very gently. The tap of the whip and the quickening of the pace will soon become associated together in the mind of the animal. If necessary, the taps may gradually fall a little heavier, and the feeling of pain be the monitor of the necessity of increased exertion. The lessons of reining in and stopping, and backing on the pressure of the bit, may continue to be practised at the same time.

He may now be taught to bear the saddle. Some little caution will be necessary at the first putting of it on. The breaker should stand at the head of the colt, patting him, and engaging his attention, while one assistant, on the off-side, gently places the saddle on the back of the animal; and another, on the near side, slowly tightens the girths. If he submits quietly to this, as he generally will, when the previous process of breaking in has been properly conducted, the ceremony of mounting may be attempted on the following or on the third day. The breaker will need two assistants to accomplish this operation. He will remain at the head of the colt, patting and making much of him. The rider will put his foot into the stirrup, and bear a little weight upon it, while the man on the off-side presses equally on the other stirrup-leather; and, according to the docility of the animal, he will gradually increase the weight, until he balances himself on the stirrup. If the colt be uneasy or fearful, he should be spoken kindly to and patted, or a mouthful of corn be given to him: but if he offers serious resistance, the lessons must terminate for that day; he may probably be in better humour on the morrow.

When the rider has balanced himself for a minute or two, he may gently throw his leg over, and quietly seat himself in the saddle. The breaker will then lead the animal round the ring, the rider sitting perfectly still. After a few minutes he will take the reins, and handle them as gently as possible, and guide the horse by the pressure of them; patting him frequently, and especially when he thinks of dismounting,—and after having dismounted, offering him a little corn or green meat. The use of the rein in checking him, and of the pressure of the leg and the touch of the heel in quickening his pace, will soon be taught, and the education will be nearly completed.

The horse having thus far submitted himself to the breaker, these pattings and rewards must be gradually diminished, and implicit obedience mildly but firmly enforced. Severity will not often be necessary; in the great majority of cases it will be altogether uncalled for: but should the animal, in a moment of waywardness, dispute the command of the breaker, he must at once be taught that he is the slave of man, and that we have the power, by other means than those of kindness, to bend him to our will. The education of the horse is that of the child. Pleasure is, as much as possible, associated with the early lessons; but firmness, or, if need be, coercion, must confirm the habit of obedience. Tyranny and cruelty will, more speedily in the horse than even in the child, provoke the wish to disobey; and, on every practicable occasion, the resistance to command. The restive and vicious horse is, in ninety-nine cases out of a hundred, made so by ill-usage, and not by nature. None but those who will take the trouble to try the experiment are aware how absolute a command the due admixture of firmness and kindness will soon give us over any horse.

CASTRATION.

The period at which this important operation will be best performed depends much on the breed and form of the colt, and the purpose for which he is destined. For the common agricultural horse, the age of four or five months will be the most advisable, or, at least, before he is weaned. Very few horses are lost when cut at that age. The weather, however, should not be too hot, nor the flies too numerous. We enter our decided protest against the recommendation of some valuable, but incautious agricultural writers, that ‘ colts should be cut in the months of June or July, when flies pester the horses, and cause them to be continually moving about, and thereby prevent swelling.’ One moment's reflection will convince the reader that nothing can be more likely to produce inflammation, and consequent swelling and danger, than the torture of the flies hovering round and stinging the sore part.

If the horse is designed either for the carriage or for heavy draught, the farmer should not think of castrating him until he be at least a twelvemonth old; and, even then, the colt should be carefully examined. If he is thin and spare about the neck and shoulders, and low in the withers, he will materially improve by remaining uncut another six months; but if his fore-quarters are fairly developed at the age of a twelvemonth, the operation should not be delayed, lest he become heavy and gross before, and perhaps have begun too decidedly to have a will of his own. No specific age, then, can be fixed; but the castration should be performed rather late in the spring or early in the autumn, when the air is temperate, and particularly when the weather is dry. No preparation is necessary for the sucking colt, but it may be prudent to bleed and to physic one of more advanced age. In the majority of cases, no after treatment will be necessary, except that the animal should be sheltered from intense heat, and more particularly from wet. In temperate weather he will do much better running in the field than nursed in a close and hot stable. The moderate exercise which he will take in grazing will be preferable to perfect inaction. A large and well-ventilated box, however, may be permitted.

The manner in which the operation is performed will be properly left to the veterinary surgeon; although we must confess that we are disposed to adhere to the old way of opening the bag on either side, cutting off the testicle, and preventing bleeding by searing the vessels with a hot iron. There is at least an appearance of brutality, and, we believe, much unnecessary pain inflicted, when the spermatic cord (the vessels and the nerve) is tightly compressed between two pieces of wood, as in a powerful vice, and left there either until the testicle drops off, or is removed on the following day by the operator. To the practice of some farmers, of *twitching* their colts at an early period, sometimes even so early as a month, we have stronger objection. When the operation of twitching is performed, a small cord is drawn as tightly as possible round the bag, between the testicle and the belly; the circulation is thus stopped, and, in a few days, the testicles and the bag drop off: but the animal suffers sadly,—it is occasionally necessary to tighten the cord on the second or third day, and inflammation and death have frequently ensued.

Chapter XIII.

THE FORE LEGS.

We arrive now at those parts of the frame most essentially connected with the action and value of the horse, and oftenest, and most annoyingly, the subjects of disease. The extremities contain the whole apparatus of motion, and it is with the action, and speed, and strength of the horse that we are most concerned.

We begin with the fore extremity, and with its upper part the shoulder It is seen at G, page 63.

THE SHOULDER.

The *scapula*, or shoulder-blade, situated forward on the side of the chest, is a bone of a somewhat triangular shape, with its apex or point downward, and its base or broad part upward. The point lies between the first and second ribs; the hinder part of the base reaches as far back as the seventh rib; it therefore extends obliquely along the chest. It is divided, externally, into two unequal portions by a ridge or spine running through almost the whole of its extent, and designed, as we shall presently show, for the attachment of important muscles. The broad or upper part having no muscles of any consequence attached to it, is terminated by cartilage.

We have stated that the muscles of the hinder legs are principally concerned in the motion of the horse. They impel the machine forward, and the main uses of the fore extremities are to lift the fore part of the horse from the ground, that it may be thus impelled to throw forward the legs as far as possible that they receive this weight at due distance, and to support the force and shock of that weight when it reaches the ground. We will inquire as we proceed how far one or all of these objects are accomplished.

The shoulder-blade is united to the chest by muscle alone. There is a large muscle, with very remarkable tendinous fibres, and of immense strength (the *serratus major*, greater saw-shaped muscle), attached to the chest, and to the extensive smooth internal surface of the shoulder-blade, and by which, assisted, or rather strengthened, by the muscles of the breast, the weight of the body is supported, and the shock of the widest leap, or the most rapid motion, sustained. Had there been a bony union between the shoulder and the body, the vital parts contained in the chest could not have endured the dreadful shock which they would occasionally have experienced; nor could any bone have long remained whole if exposed to such violence. The muscles within the shoulder-blade act as powerful and safe springs. They yield, as far as necessary, to the force impressed upon them; by their gradual yielding they destroy the violence of the shock, and then, by their elastic power, immediately regain their former situation.

SPRAIN OF THE SHOULDER.

In some violent and unexpected shock these muscles are occasionally injured. Although we do not believe that, in one case in twenty, the farrier is right when he talks of his shoulder-lameness, yet it cannot be denied, that the muscles of the shoulder are occasionally sprained. This is effected oftener by a slip or side-fall, than by fair, although violent exertion. It is of considerable importance to be able to distinguish this shoulder-lameness from injuries of other parts of the fore extremity. We shall look in vain for much tenderness, or heat or swelling: it is a sprain of muscles deeply seated, and where these symptoms of injury cannot possibly exist. If, on standing before the horse, and looking at the size of the two shoulders, or rather their points, one should appear evidently larger than the other, we must not consider this as indicative of sprain of the muscles of the shoulder. It probably arises from bruise of the point of the shoulder, which a slight examination will determine; or the whole of the limb, this portion of which is enlarged, may be sound, while the other may be shrunk from want of equal exertion, arising from injury of long standing. The heat and tenderness, if there be any, will be found within the arm, close to the chest; and will belong more to the muscles of the breast than to those under the shoulder.

The symptoms, however, of shoulder-lameness can scarcely be mistaken; and, when we relate them, the farmer will recollect, that they very seldom occurred when the village-smith pointed to the shoulder as the seat of disease, and punished the animal for no purpose. In sprain of the shoulder the horse will evidently suffer extreme pain while moving, and the muscle underneath being inflamed and tender, he will extend it as little as possible. *He will drag his toe along the ground.* It is in the lifting of the foot that the shoulder is principally moved: if the foot be lifted high, let the horse be ever so lame, the shoulder is little, if at all affected. The lame limb is suffered to bear the weight a much shorter time in this than in any other kind of lameness. In sprain of the back sinews, it is only when the horse is in motion that the injured parts are put to most pain; the pain is greatest here when the weight rests on the limb, and, therefore, there is a peculiar quickness in catching up the limb, in shoulder-lameness, the moment the weight is thrown on it. This is particularly evident when the horse is going down hill, and the injured limb bears an additional portion of the weight. In the stable, too, when the horse points or projects one foot before the other, that foot is usually flat on the ground. In shoulder-lameness the toe alone rests on the ground. The circumstance which most of all characterizes this affection, is, that when the foot is lifted, and then brought considerably forward, the horse will express great pain, which he will not do if the lameness be in the foot or the leg. We have dwelt longer on this point, that our readers may be enabled to put to the test the many cases of shoulder-lameness which exist only in the imagination of the groom or the farrier.

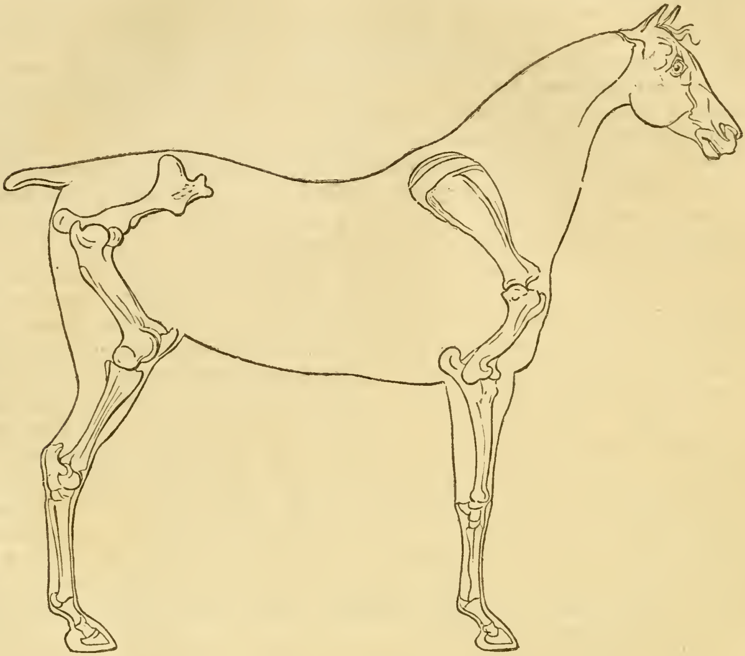
In sprain of the internal muscles of the shoulder, few local measures can be adopted. The horse should be bled from the vein on the inside of the arm (the plate vein), because the blood is then abstracted more immediately from the inflamed part. A dose of physic should be given, and fomentations applied, and principally on the inside of the arm, close to the chest; while the horse is kept as quiet as possible. The injury is too deeply seated for external stimulants to have very great effect, yet a blister will very properly be resorted to, if the lameness is not speedily removed. The *swimming* of the horse is an inhuman practice; it tortures the animal, and increases the inflammation. The *pegging* of the shoulder (puncturing the skin, and blowing into the cellular structure beneath, until it is considerably puffed up) is another relic of ignorance and barbarity.

SLANTING DIRECTION OF THE SHOULDER.

The lessening or breaking of the shock, from the weight being thrown violently on the fore legs, is effected in another way. It will be observed, that (see G and J, p. 63) the shoulder-blade and the lower bone of the shoulder are not connected together in a straight line, but form a very considerable angle with each other. This will be more evident from the following cut, which represents the fore and hind extremities in the situations which they occupy in the horse.

This angular construction of the limbs reminds us of the similar arrangement of the springs of a carriage, and the ease of motion, and almost perfect freedom from jolting, which are thereby obtained.

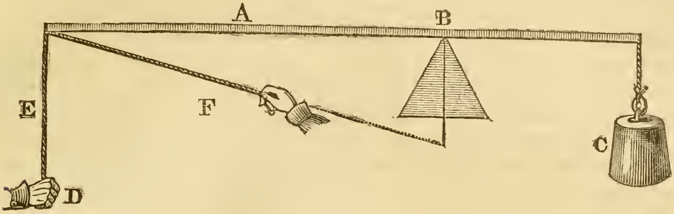
We will not say that the form of the spring was borrowed from this construction of the limbs of the horse, but the effect of the carriage-spring beautifully illustrates the connexion of the different bones in the extremities of this quadruped.



The obliquity or slanting direction of the shoulder effects another very useful purpose. That the stride in the gallop, or the space passed over in the trot, may be extensive, it is necessary that the fore part of the animal should be considerably elevated. The shoulder, by means of the muscles which extend from it to the inferior part of the limb, is the grand agent in effecting this. The slightest inspection of the last cut, or of that at p. 63, will show that, just in proportion as the point of the shoulder is brought forward and elevated, will be the forward action and elevation of the limb, or the space passed over at every effort. At each contraction of the muscles which extend from G to J, or from the shoulder-blade to the bone of the arm, will the point of the shoulder be projected and elevated. In the upright shoulder it can scarcely be carried beyond the point at which it is placed in these cuts. In the oblique or slanting shoulder it commences its action from that point; therefore it is that a slanting shoulder is indispensable in a horse from which good action and considerable speed are required.

The slanting shoulder accomplishes another very useful object. The muscles extending from the shoulder-blade to the lower bone of the shoulder are the powers by which motion is given to the whole of the limb. The extent and energy of that motion depend much on the force exerted or the strength of the muscle; but there are circumstances in the relative situations of the different bones which have far greater influence. Let us suppose that by means of a lever we are endeavouring to raise a certain weight.

A is a lever, resting or turning on a pivot B; C is the weight to be raised, and D is the power and the situation at which the power is applied. If we apply our strength in a direction perpendicular to the lever, as represented by the line E, we can easily calculate the strength which we must exert. In proportion as the distance of the power from the pivot or centre of motion exceeds that of the weight from the same place, so will be the advantage gained. The power here is twice as far from the centre as the weight is, and therefore we *gain* advantage in the proportion of two to one; or if the weight be equal to 200 lbs., a force of 100 lbs. will balance it. If we alter the direction in which the power is applied, and suppose it to be in that of the line F, will 100 lbs. now do? No; nothing like it. How shall we calculate, then, the power that is necessary? We must prolong the line of direction until another line, falling perpendicularly from the lever, and commencing at the centre of motion, will cut it; and the length of that line will give us the actual effect of the strength we employ. Now, this new line is but half as long as the distance of the weight from the centre of motion, and therefore we *lose* advantage in the proportion of two to one; or a strength equal to 400 lbs. must be exerted to raise the 200 lbs., and so on in proportion to the deviation from the right or perpendicular line.



Let us next take the shoulder of the horse. The point of the shoulder, the shoulder joint, is the pivot or centre of motion; the leg attached to the bone of the arm is the weight; the shoulder-blade being more fixed is the part whence the power is exerted; and the muscles extending from the one to the other are the lines in which that power is exerted. These lines approach much more nearly to a perpendicular in the oblique than in the upright shoulder (see cut). In the upright shoulder, the shoulder-blade and the bone of the arm are almost in a straight line, and the real action and power of the muscle are most strangely diminished. In this point of view the oblique shoulder is most important. It not only gives extensive action, but facility of action; the power of the muscles is more than doubled by being exerted in a line approaching so much nearer to a perpendicular.

There is yet another advantage of the oblique shoulder. The point of the shoulder is projected forward; and therefore the pillars which support the fore part of the horse are likewise placed proportionably forward, and they have less weight to carry; and are exposed to less concussion, and especially concussion in rapid action. The horse is also much safer; for having less weight lying before the pillars of support, he is not so likely to have the centre of gravity thrown before and beyond them by an accidental trip; or, in other words, he is not so likely to fall; and he rides more pleasantly, for there is far less weight bearing on the hand of the rider, and annoying and tiring him. It likewise happens unfortunately that nature, as it were to supply the deficiency of action and of power in an upright shoulder, has accumulated on it more muscle, and therefore the upright shoulder is proverbially thick and cloddy; and the muscles of the breast which were designed to strengthen the attachment of the shoulders to the chest, and to bind them together, must, when the point of the shoulder lies backward, and under the horse, be proportionably thickened and strengthened, and the horse is thus still more heavy before, more unpleasant, and more unsafe to ride.

Then, ought every horse to have an oblique shoulder? No! We have been speaking of those which are designed to ride pleasantly, or from which extensive and rapid action is required. In them we have said that an oblique shoulder is indispensable: but there are others which are never ridden; whose pace is slow, and who have nothing to do but to throw as much weight as possible into the collar. To them an upright shoulder is an advantage, because its additional thickness gives them additional weight to throw into the collar, which the power of their hinder quarters is fully sufficient to accomplish; and because the upright position of the shoulder gives that direction to the collar which enables the horse to act upon every part of it; and that inclination of the traces which will enable his weight or power to be most advantageously employed. Of this, however, we shall better speak when we come to describe the implements of agriculture, and particularly the construction of wheel carriages.

An improved breed of our heavy draught horses has of late years been attempted, and with much success. Sufficient uprightness of shoulder is retained for the purposes of draught, while a slight degree of obliquity has materially quickened the pace and improved the appearance.

Above its junction with the humerus, or lower bone of the shoulder, the shoulder-blade forms what is called the point of the shoulder. There is a round blunted projection, best seen in the cut (p. 230). The neck of the shoulder-blade then forms a shallow cavity, into which the head of the next bone is received.

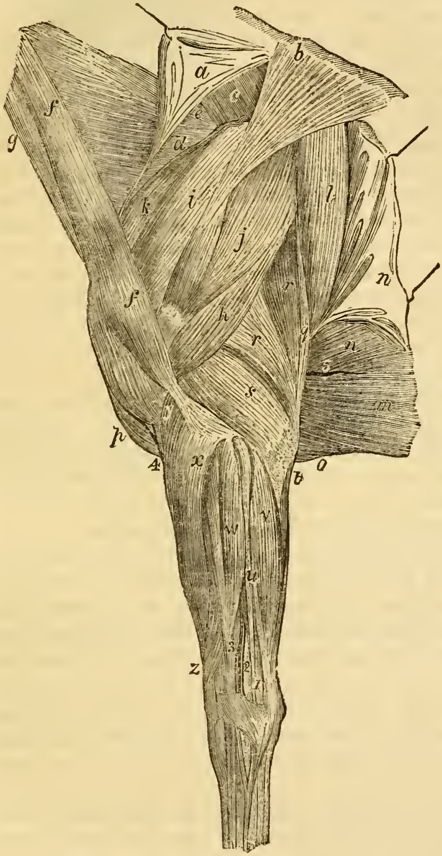
The cavity is shallow because extensive motion is required, and because both of the bones being so moveable, and the motion of the one connected so much with that of the other, dislocation was not so likely to happen as if one of them had been fixed. A *capsular* ligament, or one extending round the heads of both bones, confines them securely together.

This joint is rarely or never dislocated; or should it suffer dislocation, the muscles of the shoulder-blade and the lower bone of the shoulder are so strong, that the reduction of it would be impossible. The point of the shoulder, however, projecting considerably, is much exposed to injury from accident or violence; even turning in a narrow stall has inflicted a serious bruise. Fomentations of warm water will usually remove the tenderness and lameness, but should they fail, blood may be taken from the plate vein, and, in very obstinate cases, a blister may be resorted to.

A description of the principal muscles of the shoulder-blade, their situation, attachments, and use, may not be uninteresting to the lover of the horse, and may guide his judgment as to the capability and proper form of that noble animal.

CUT OF MUSCLES ON THE OUTSIDE OF THE SHOULDER.

a and *b* represent a portion of the muscle (the *trapezius*, quadrangular muscle), which rises from the longer bones of the withers, broadly and strongly, and from the ligament of the neck (a portion of which is seen at *b*), and narrowing below, and terminating almost in a point, is inserted into a prominent part of the spine or ridge of the shoulder-blade. It occupies the space between the withers and the upper part of the shoulder-blade, and is large and strong in proportion to the height of the withers, and the slanting of the shoulder. Its use is evidently to support the shoulder, to raise it, and likewise to draw it backward; therefore, constituting one of the most important muscles connected with the action of the horse, and illustrating the advantage of high withers and a slanting shoulder. A portion of it is represented as turned back, to show other muscles beneath. A moment's inspection will convince the reader, that although we may have been justified in objecting to a low forehead and thick shoulder, yet still some fulness and fleshiness are necessary, even about the withers; otherwise, although there may be height of withers, and obliquity of shoulder, to give extensive action, there will not be sufficient muscular power to work the machine with either quickness or continuance.



At *c* is a portion of the *levator humeri* (the raiser of the shoulder), descending even from the tubercle at the back of the head (see cut, page 63), and from the base of the temporal bone, and attaching itself to the first four bones of the neck, and to the ligament of the neck; inserting itself into the covering of the muscles of the shoulder, and the muscles about the point of the shoulder, and at length terminating in a ridge on the lower bone of the shoulder. It is a muscle of immense power and great utility, raising and drawing forward the shoulder and the arm, and, when these are fixed, turning the head and neck if one acts, and depressing them if the muscles on both sides act at the same time.

At *d* is a portion of the great saw-like or tooth-shaped muscle of the shoulder, constituting the bulk of the lower part of the neck; deeply seated; arising, as here seen, from the five last bones of the neck, and the two first ribs, and the lower portion of it springing from all the true ribs; all the fibres tending towards, and inserted into the inner surface of the shoulder; and by means of which the shoulder is attached to the chest, and the immense weight of the body supported. We have already spoken of the use of this muscle in obviating concussion.

When the horse is standing, this muscle occasionally discharges another important function. The shoulders and legs are then rendered fixed, and immoveable by the weight of the body; and this muscle no longer being able to move the limbs, exerts its power in enlarging the cavity of the chest, and thus materially assists in the act of breathing. Therefore, as we have stated when treating of that disease, a horse labouring under inflammation of the lungs will obstinately stand night and day, that he may obtain the assistance of this muscle in respiration, which is become laborious and painful; and we regard his lying down as one of the most favourable symptoms that can occur, because it shows us that the breathing is so much relieved that he needs not the assistance of this muscle.

At *e* is a small portion of the splenius muscle, of which we have spoken when describing the neck, p. 154.

f represents a muscle sometimes described as a portion of the raiser of the shoulder, arising from the nipple-shaped process of the temporal bone, running down the somewhat lateral but fore-part of the neck, inserted into the upper and middle part of the lower bone of the shoulder, and thence continued down to the arm. Its office is to bend the head; or, the head and neck being fixed, to elevate and bring forward the arm. It is in powerful action when the horse is running at his speed with the head projected.

At *g* is a portion of the *sterno-maxillaris*, or muscle common to the fore-part of the chest and the lower jaw, and described at p. 156.

h gives the principal muscle extending from the shoulder to the lower bone of the shoulder, and employed in drawing this bone towards the shoulder-blade, and bending the whole of the limb. Exceedingly powerful action is required from this muscle, therefore it is very tendinous, and inserted in such a direction as to act with great mechanical advantage, and that advantage increased in proportion to the slanting of the shoulder.

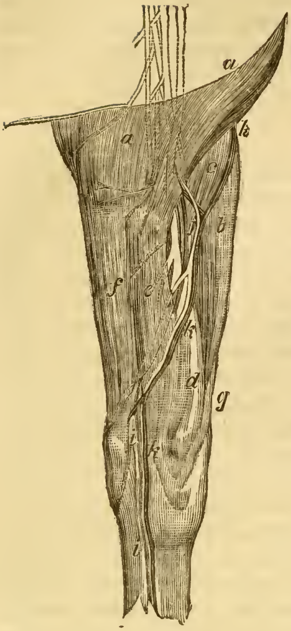
The muscle at *i*, *antea spinatus* (before the spine) is situated, as its name would intimate, on the external part of the shoulder before the spine or ridge, and fills the whole of that space. It proceeds towards the bone of the arm, and, dividing into two parts, is inserted into the two prominences in front of that bone. It is a very strong muscle, and extends the arm and carries it forward.

The muscle at *j*, *postea spinatus* (behind the spine or ridge), occupies that space. It likewise goes to the lower bone of the shoulder, and is inserted into the outer and upper head of the bone. It draws this bone outward and upward.

At *k* is a muscle common to the breast and the shoulder-blade, and called *the little pectoral*, or breast muscle. It arises from the breast-bone, and reaches to the covering of the shoulder-joint, and the muscles of the shoulder. Its action, in common with that of a larger muscle, seen at *m* (*the great pectoral*), is to draw back the head of the lower bone of the shoulder and the lower part of the shoulder-blade, and to make the latter bone more upright.

At *q* is the tendon of a very important muscle, the long extensor of the arm, extending from the upper angle, and the posterior border of the shoulder-blade, to the point of the elbow, and the inside of the arm, and which will be presently described; and at *r* and *s* are the three divisions of another muscle concerned in the same office, arising from the shoulder-blade and the lower bone of the shoulder, and likewise attached to the point of the elbow by a very strong tendon.

This cut represents the muscles on the inside of the shoulder and fore-arm. *a* is a very prominent one. It is called the *pectoralis transversus* (the muscle crossing the breast). It arises from the first four bones of the chest, and runs across to the inner part of the arm, and is inserted



into the tendinous substance covering the muscles of the forearm, and reaching a considerable way down the arm. The use of this muscle is obvious and important. It binds the arm to the side of the horse; it keeps the legs straight before the horse when he is at speed, that the weight of the body may be received on them in a direction most easy and safe to the horse and to the rider, and most advantageous for the full play of all the muscles concerned in progression. Considering the unevenness of surface over which a horse often passes, and the rapid turnings which are sometimes necessary, these muscles have enough to do: and when the animal is pushed beyond his strength, and these muscles are wearied, and the forelegs spread out, and the horse is "*all abroad*," the confused and unpleasant manner of going, and the sudden falling off in speed, are well known to every rider.

THE LOWER BONE OF THE SHOULDER.

Forming a joint with the shoulder-blade at the point of the shoulder is the *humerus*, or lower bone of the shoulder (J. p. 63, and p. 230). It is a short strong bone, slanting backward in an opposite direction to the shoulder-blade. At the upper part it has a large round head, received into the shallow cavity of the shoulder-blade. It has several protuberances for the insertion of muscles, and is terminated below by two *condyles* or heads, which in front receive the principal bone of the arm between them as in a groove, thus adding to the security and strength of the joint, and limiting the action of this joint, and of the limb below, to mere bending and extension, without any side motion. Farther behind, these heads receive the elbow deep between them, to give more extensive action to the arm. In a well-formed horse this bone can scarcely be too short, in order that the fore-legs may be as forward as possible, for reasons at which we have already glanced; and because, when the lower bone of the shoulder is long, the shoulder must be too upright. Dislocation can scarcely occur in either of the attachments of the bone, and fracture of it is almost impossible. The lower bone of the shoulder, and the shoulder-blade, are by horsemen confounded together, and included under the appellation of the *shoulder*, and in compliance with general usage we have described them as combining to form the shoulder.

Among the muscles arising from the lower bone of the shoulder, are two short and very strong ones, seen at the lower *r* and *s*, the first proceeding from the upper part of this bone to the elbow, and the second from the internal part, and likewise going to the elbow, and both of them being powerful agents in extending the leg.

In front, at *y*, is one of the muscles of the lower bone of the shoulder, *the external one*, employed in bending the arm; arising from the inner and back part of the neck and body of the lower bone of the shoulder, turning obliquely round that bone, and inserted into the inner and upper part of the bone of the arm.

THE ARM.

The *arm* extending from the elbow to the knee (see K and L, p. 63, and also cut, p. 230), consists, in the young horse, of two distinct bones. The long and front bone, called the *radius*, is nearly straight, receiving into its upper end the lower heads of the lower bone of the shoulder; and the lower end corresponding with the upper layer of the bones of the knee. The short and hinder bone is called the *ulna*. It has a very long and powerful projection, received between the heads of the lower bone of the shoulder, and called the elbow; it then stretches down, narrowing by degrees (see L, p. 63, and the cut, p. 230) to below the middle of the front bone, where it terminates in a point. The two bones are united together by cartilage and ligament, but these are by degrees absorbed and changed to bone, and before the horse becomes old the whole of the arm consists of one bone only.

It will be perceived that, from the slanting direction of the lower bone of the shoulder, the weight of the horse, and the violence of the concussion, will be shared between the *radius* and the *ulna*, and therefore less liable to injure either; and the circumstance of so much weight and jar being communicated to them, will account for the extensive and peculiarly strong union between these bones in the young horse, and the speedy inflammation of the uniting substance and absorption of it, and substitution of bone, and complete bony union between the radius and ulna, in the old horse. The immense muscles which are attached to the point of the elbow likewise render it necessary that the union between these bones should be very strong.

The arm is a most important part of the horse, as will be seen when we describe the muscles which belong to it. We have spoken of those at *q*, *r*, and *s*, proceeding from the shoulder-blade and the lower bone of the shoulder, and inserted into the elbow. They are the grand agents in extending the arm; and in proportion to the power which they exert, will be the quickness and the length of the stride. The strength of the horse, so far as his fore-limbs are concerned, principally resides here. Then we look for a large and muscular arm, and we look likewise for such a formation of the limb, and particularly of the elbow, as will enable these muscles to act with most advantage.

The principle of the lever, to which we have referred (p. 231), is here beautifully applicable. The elbow-joint is the centre of motion; the whole of the lower part of the leg is the weight to be raised; and the power by which it is to be raised in one act of progression, the extending of the limb, is the muscles inserted into the elbow. In proportion as the weight is more distant than the power from the centre of motion, as it is in the construction of this limb, so will be the greater degree of energy requisite to be exerted. We will suppose that the weight, taking the knee to be the centre of it, is eighteen inches from the elbow-joint, that the limb weighs 60 lbs., and that the elbow projects two inches from the joint; then an energy equal to nine times the weight, or 540 lbs., will be needed to move and extend the limb, because the weight is nine times farther from the centre of motion than the power is. We will suppose that in another horse the point of the elbow projects three inches from the joint, the weight of the leg remaining the same. Three are one-sixth of eighteen; and only six times the force, or 360 lbs., will be required, making a difference in, or saving of muscular action, equal to 180 lbs. in each extension of the arm. If a few pounds in the weight of the rider tell so much for or against the horse in a long race, this saving of power must make an almost incalculable difference; and, therefore, judges of the horse rightly attach so much importance to the depth of the elbow, or the projection of the point of the elbow from the joint.

When describing the proper obliquity of the shoulder, we proved that the power was exerted with most advantage in a line perpendicular to the arm of the lever, and that the slightest deviation from that line was manifestly disadvantageous. If the reader will examine the cut he will perceive that muscles from the shoulder and the bone of the arm take a direction much nearer to a perpendicular line in the long than in the short elbow, and therefore act with proportionably greater advantage; and if we add this advantage from the direction in which the power is applied to that which we gain from the increased length of the bone, we shall be justified in affirming that the addition of one-third to the length or projection of the elbow would be attended by a saving of one-half in the expenditure of muscular power. There is, however, a limit to this. In proportion as the elbow is lengthened, it must move over a greater space in order to give the requisite extension to the limb; and consequently the muscles which act upon it must be lengthened, otherwise we might have easy but confined action. There must be harmony of proportion in the different parts of the limb, but a deep elbow, within a certain range, is always connected with increased power of action.

The elbow is sometimes fractured. If the animal be placed in the hands of a skilful veterinarian, although the chances of cure are certainly against the horse, yet the owner need not despair. Absolute and long-continued rest, and that produced by means of a sling, will be indispensable.

Enlargements sometimes appear about the elbow, either the consequence of a violent blow, or from the calkins of the shoes injuring this part when the horse sleeps with his legs doubled under him. If a seton be passed through the tumour, it will sometimes rapidly diminish, and even disappear; but if it be of considerable magnitude, the skin should be slit open along the middle of the swelling, and the tumour dissected out.

The elbow-joint is sometimes punctured, either accidentally, or through the brutality of the groom or carter. The swelling is often rapid and extensive, and fatal inflammation may ensue. Rest, and the closure of the wound, are the most important considerations.

There are other muscles of the fore-arm employed in extending the limb. At *x*, page 233, is the principal one, called the *extensor of the leg;* it is of considerable bulk, and occupies the front part of the arm. It arises from the lower part of the body of the lower bone of the shoulder, and from its outer head. As it descends down the arm, it becomes tendinous; the tendon passes under one of the ligaments of the knee; it then spreads out, and is inserted into the fore and upper part of the shank bone. It is also seen at *b*, page 235.

The next muscle in situation and importance is seen at *w*, and called the *extensor of the foot.* It rises from the outer head of the lower bone of the shoulder, and likewise from the outer head of the bone of the arm. It becomes tendinous as it proceeds, and passes under a strong ring at the knee, by which it is confined in its proper situation; it then runs along the front of the shank-bone, tied down by strong cellular substance; passes over the fetlock, and part of the upper pastern; is inserted into the lower part of the upper pastern, into the lower pastern, and the coffin-bone or bone of the foot. It therefore extends all these bones; and as it passes over the shank, being tied down to it in every part of its course, it likewise serves to extend that bone.

At *u*, page 233, is the tendon of another extensor muscle, and at *z* a curious oblique one, passing over the tendon of *x*, confining it in its situation, and likewise itself assisting in extending or straightening the leg.

The muscles employed in bending the leg are both numerous and powerful. Two of the superficial ones are given in the cut, page 233. The first is at *t*, page 233; it is also seen at *b*, page 235. It is called the middle *flexor*, or bending muscle of the shank-bone, because it lies precisely on the middle of the back part of the arm. It arises from the inner head of the lower bone of the shoulder, and is inserted into one of the bones on the inner side of the knee. The other is seen at *v*, page 233. It is called the external flexor of the leg, because it lies on the outer side of the arm, towards the back. It arises from the outer head of the lower bone of the shoulder; advancing towards the knee, it is tendinous, and the tendon divides into two portions, one of which is inserted into the same bone of the knee, and the other into the outer small bone of the leg. The internal flexor is seen at *e*, page 235. It proceeds from the inner head of the lower bone of the shoulder, and is inserted into the head of the inner splint bone, and its office is to bend the leg, and very slightly turn it. A portion of one of the most powerful of the flexor muscles, and powerful indeed they must be, is delineated at *c*, page 235. It is the *flexor of the arm*. It rises from the extremity of the ridge of the shoulder-blade in the form of a large and round tendon, which runs between two prominences in the upper part of the front of the lower bone of the shoulder, in as perfect a groove or pulley as art ever contrived. This groove is lined with smooth cartilage; and between it and the tendon there is an oily fluid, so that the tendon plays freely in the pulley without friction. Having escaped from this pulley, and passed the head of the lower bone of the shoulder, the cord swells out into a round fleshy body, still containing many tendinous fibres. Deeply seated, it contributes materially to the bulk of the front of the arm; and, having reached the arm, it is inserted into the head and neck of the bone of the arm, and likewise into the capsular ligament of the elbow joint. It is the main muscle by which, almost alone, the whole of the leg below the arm is bent.

It acts at great disadvantage. It is inserted into the very head of the bone of the arm, and expanded even upon the joint. Then the power is applied almost close to the centre of motion, while the weight to be raised is far distant from it. The power is thirty times nearer the centre of motion than is the weight; and, calculating, as before, the weight of the arm and the rest of the limb at 60 lbs., it must act with a force of thirty times sixty, or 1800 lbs. In addition to this, the line of the direction of the force strangely deviates from a perpendicular: the direction of the muscle is nearly the same as that of the limb, and the mechanical disadvantage is almost incalculably great. We will take it at only ten times more; then this muscle, and its feeble coadjutors, act with a force of ten times 1800 or 18,000 lbs.

Why this almost incredible expenditure of muscular power?—First, that the beauty of the limb might be preserved, and the joint might be compact. If the tendon had been inserted half way down the arm, the elbow-joint would have offered a very unsightly appearance.

Beauty of form, however, is the least result of this conformation; without it the animal would not have been fitted for the purposes to which we devote him. It is a law of mechanics, that what is lost in power is gained in velocity. The product of the power, and the space passed over by the arm of the lever to which it is attached, must always be equal to the product of the weight, and of the space passed over by the arm that supports it; and if a power, equal to thirty times the weight, is obliged to be exerted at the upper part of the bone of the arm, the centre of that bone, which may be considered as the centre of the weight, will pass over thirty times the space, and the extremity of the limb will pass over sixty times the space. The muscle will contract with a great deal of rapidity, but the foot will move with sixty times that rapidity, in order to pass over sixty times the space in the same time. This is precisely what we want. Extensive and rapid motion are the excellences of the horse. He is valuable in proportion as he has them, combined with stoutness; and by this conformation of the limb alone could he obtain them. Therefore the tendon is at first unusually strong; it plays through the natural but perfect pulley of the bone of the arm without friction; the body of the muscle is mixed with tendinous fibres, and the insertion into the fore-arm is very extensive, lest the application of such immense force should tear it from its adhesions. There is sufficient strength in the apparatus; the power may be safely applied at this mechanical disadvantage; and it is applied close to the joint to give an extent and rapidity of motion which could not otherwise have been obtained, and without which the horse would have been comparatively useless.

At the back of the arm are other flexor muscles of great power, to bend the lower portions of the limb. We have described two of them belonging to the arm and the leg, and we must not pass over the very peculiar ones acting on the feet. Only a small portion of one of them can be seen in our cut, page 233, at 1.

The first is the *perforated flexor* muscle: the reason of the name will presently appear. It arises from the lower and back part of the inner head of the lower bone of the shoulder, and intermixed with, or rather between the origins of the muscle next to be described, and called the perforating muscle. As it descends along the bone of the arm, it becomes tendinous; and, approaching the knee, it is bound down by arches or bands of ligament, that it may not start in sudden and violent action. Proceeding from the knee, it widens, and partly wraps round the tendon of the perforating muscle, and they run down together in contact, yet not adhering; freely playing over each other, and mucous fluid obviating all friction. Both of them are inclosed in a sheath of dense cellular substance, attached to them by numerous fibrils; and they are likewise supported by various ligamentous expansions. Near the fetlock the tendon still farther expands, and forms a complete ring round the tendon of the perforating muscle. This is seen at J, p. 111. The use of this will be best explained when we are treating of the fetlock. The perforated tendon soon afterwards divides, and is inserted into the smaller and larger pastern bones, and flexes or bends them.

The next is the *perforating flexor* muscle. It has nearly the same origin as the other, but with somewhat distinct heads. It continues muscular farther down the arm than the perforated, and lies before it. At the knee it passes, like the perforated, under strong ligamentary arches, which confine it in its situation. It then becomes round, and is partly wrapped up in the perforated; and at the fetlock is entirely surrounded by it. It emerges from the perforated when that tendon divides, and continues its progress alone after the other has inserted itself into the pasterns, and, passing over the navicular bone, terminates on the base of the coffin-bone, or bone of the foot.

It is sufficiently plain that the arm should be large and muscular, otherwise it cannot discharge all these duties. Horsemen differ on a variety of other points, but here they are agreed. A full and swelling fore-arm is the characteristic of every thorough-bred horse, and for speed and continuance he is unequalled. Whatever other good points a horse may possess, if the arm be narrow in front and near the shoulder, flat on the side, and altogether poor in appearance, that horse is radically defective: he can neither raise his knee for rapid action, nor throw his legs sufficiently forward.

The arm should likewise be long. In proportion to the length of the muscle is the degree of contraction of which it is capable; and in proportion to the degree of contraction in the muscle will be the extent of motion in the part of the limb beneath. A racer, with a short arm, would be sadly deficient in stride; a hunter, with the same defect, would not be able to double his legs well under him in the leap. There is, however, a medium in this, and the advantage of length in the arm will depend on the use to which the horse is applied. The lady's horse, the cavalry horse, every horse in which prancing action is esteemed a beauty, and in which utility is, to a certain degree, sacrificed to appearance, must not be too long in the arm. If he be long there, he will be proportionably short in the leg; and although this is an undoubted excellence, whether speed or continuance be regarded, the short leg will not give the grand and imposing action which fashion may require: and, in addition to this, a horse with short legs may not have quite so easy action as another whose length is in the shank rather than in the arm.

THE KNEE.

The *Knee* (M, p. 63, and cut, p. 230) constitutes the joint or joints between the arm and the shank or leg; and it is far more complicated than any joint we have yet considered. Beside the lower head of the bone of the arm, and the upper heads of the three bones of the leg, there are no less than six other bones interposed, arranged in two rows, three in each row, and the seventh placed behind the other, to which an eighth is sometimes added.

What was the intention of this complicated structure? A joint between the elbow and the fetlock was absolutely necessary to the action of the horse. An inflexible pillar of that length could scarcely have been lifted from the ground, and certainly could not have been lifted far enough for rapid or safe motion. It was likewise necessary, that the interposing joint should be so constituted as to preserve this part of the limb in a straight direction, and should possess sufficient strength to resist all common work and accidents. Being in a straight direction, the shock or jar between the ends of the bones of the arm and the leg would be dreadful, and would speedily inflict irreparable injury. The heads of all bones are covered with elastic cartilage, to protect them from injury by concussion, but this would be altogether insufficient here. Six distinct bones, then, are placed here, each covered above and below by a thick coating of cartilage, connected together by strong ligaments, but separated by fluids and membranes interposed. The concussion is thus spread over the whole of them—shared by the whole of them; and, by the peculiarity of their connexion, deadened and rendered harmless.

These six distinct bones, united to each other by numerous and powerful ligaments, will also afford a far stronger joint than the apposition of any *two* bones, however perfect and strong might be the capsular ligament, or by whatever other ligaments it could be strengthened. In addition to the connexion between the individual bones, there is a perfect capsular ligament here, extending from the bone of the arm to those of the leg; and the result of the whole is, that, although the centre of such a column must be the weakest part, and most liable to bow out and give way, the hardest work and the severest accidents produce little deformity, and no dislocation in the knee: nor do the shocks and jars of many a year cause inflammation or disease. It is an undeniable fact, that such is the perfect construction of this joint, and to so great a degree does it lessen concussion, that the injuries resulting from hard work are, almost without an exception, found below the knee.

The seventh bone, the *trapezium*, so called from its quadrangular figure, is placed (see M, p. 63) behind the others, and does not bear the slightest portion of the weight. It, however, is very useful. Two of the flexor muscles, already described, proceeding from the bone of the arm, are inserted into it; and thus, being thrown off the limb, have a less oblique direction given to them; and, therefore, according to the principle of the lever, act with considerably more power. It is also useful in another way. As the tendons of the various muscles descend the limbs, they are tied down, as we have described, by strong ligamentous bands: this is particularly the case in the neighbourhood of the joints. The use of this is evident. The extensor tendons, which lie principally on the front of the leg, are prevented from starting, and strengthened and assisted in their action; but the flexor tendons which lie at the back would be liable to friction, and their motion would be impeded, if they were bound down too tightly. This projecting bone prevents the annular or ring-like ligament from pressing too closely on the main flexor tendons of the foot; and while it leaves them room to play, leaves room likewise for a little bag, filled with mucus to surround them, which mucus, oozing slowly out, supplies the whole course of the tendons down the legs with a fluid that takes away the possibility of injurious friction.

The knee should be broad. It should present a very striking width, compared with the arm above, or the shank below. The broader the knee is, the more space there is for the attachment of muscles, and for the accumulation of ligamentous expansions and bands. In proportion to the breadth of the knee there will be more strength; and likewise the direction of some muscles will be less oblique, and those of others will be more removed from the centre of motion; and, in either case, much power will be gained.

BROKEN KNEES.

The treatment of broken knees is a subject of considerable importance, for many horses are sadly blemished, and others are destroyed, by wounds in the knee-joint. The horse, when falling, naturally throws his knees forward; they receive all his weight, and are sometimes very extensively lacerated. The first thing to be done is, by very careful washing with warm water, to cleanse the wound from all gravel and dirt. It must then be ascertained whether the joint is penetrated. The grating of the probe on one of the bones of the knee, on the depth to which the probe enters the wound, will often too plainly indicate that the joint has been opened. Should any doubt exist, let a linseed-meal poultice be applied. This will at least act as a fomentation to the wound, and will prevent or abate inflammation; and when, twelve hours afterwards, it is taken off, the *synovia*, or *joint-oil*, in the form of a glairy, yellowish, transparent fluid, will be seen, if the capsular ligament has been penetrated. Should doubt remain after the first poultice, apply a second.

The opening of the joint being ascertained, the first and immediate care is to close the orifice; for the fluid which separated and lubricated the bones of the knee being suffered to flow out, they will be brought into actual contact with each other; they will rub upon each other; the delicate membrane with which they are covered will be highly inflamed; the constitution will be speedily affected, and a degree of fever will ensue that will destroy the horse: and, in the mean time, of all the tortures that can be inflicted on the poor animal, none can equal that which accompanies inflammation of the membranes lining the joints.

The manner of closing the orifice must be left to the judgment of the veterinary surgeon, who alone is capable of properly treating such a case. It may be effected by a compress enclosing the whole of the wound, and not to be removed for many days; or it may be attempted by the old and generally successful method of applying the hot iron over the wound, and particularly over the spot where the ligament appears to be lacerated. A poultice may then be placed on the part, and the case treated as a common wound. Should the joint-oil continue to flow the iron may be applied a second, or even a third time. By the application of the iron, so much swelling is produced on the immediate puncture, and in the neighbouring parts, as mechanically to close and plug up the orifice.

If, however, the opening into the joint be extensive, and the joint-oil continues to flow, and the horse is evidently suffering much pain, humanity will dictate that he should be destroyed. The case is hopeless. A high degree of fever will ere long carry the animal off, or the inflammation will cause a deposit of matter in the cavity of the joint which will produce incurable lameness.

The pain caused by the iron is doubtless great; it is, however, necessary: but let no reader of 'The Horse' permit the torturing experiments of the farrier to be tried, who will frequently *inject* stimulating fluids, and even oil of vitriol, into one of the most sensible and irritable cavities in the whole frame.

A person well acquainted with the anatomy of the part will judge of the probability of a favourable result, not merely by the extent, but by the situation of the wound. If it is low down and opposite to the bottom row, a small opening into the joint will be easily closed; a larger one need not cause despair, because there is little motion between the lower row and the bones of the leg. If it be high up, there is more danger, because there is more motion. If it be situated opposite to the union of the two rows, the result is most to be dreaded, because between these is the principal motion of the joint, and that motion would not only disunite and irritate the external wound, but cause dreadful friction between the bones brought into actual contact with each other, through the loss of the joint-oil.

When the skin has been lacerated, although the wound may be healed, some blemish will remain. The extent of this blemish will depend on the extent and nature of the original wound, and more especially on the nature of the treatment which has been adopted. Every caustic application will destroy more of the skin, and leave a larger mark. Should the blemish be considerable, a mild blister may be applied over the part, after the wound has healed. It will stimulate the hair to grow more rapidly and thickly round the scar, and particularly hair of the natural colour; and by contracting the skin it will lessen the scar itself. Many persons have great faith in ointments, which are said to promote the growth of the hair. If they have that property, it must be from stimulating the skin, in which the roots of the hair are embedded. These ointments must contain a small portion of blistering matter, in the form of turpentine, or the Spanish-fly. The common application of gunpowder and lard may, by blackening the part, conceal the blemish, but can have no possible effect in quickening the growth of the hair.

In examining a horse for purchase, the knees are very strictly scrutinized. A blemish on them should not induce us at once to condemn the animal; for a bad rider, or the merest accident, may throw the safest horse. A broken knee, however, is a suspicious circumstance, and calls for the most careful observation of the make and action of the horse. If it be accompanied by a thick and upright shoulder, and legs far under the horse, and low slovenly action, he is unwise who does not take the hint: this faulty conformation has produced its natural consequence. But if the shoulder be oblique, and the withers high, and the fore-arm strong, the good judge will not reject the animal, because he may have been accidentally thrown.

THE LEG.

The part of the limb between the knee and the fetlock consists of three bones—a large one before, called the *cannon* or *shank*, and two smaller or *splint* bones behind (see N, p. 63). The shank-bone is rounded in front, and flattened, or even concave behind. It is the straightest of the long bones, as well as the most superficially situated, for in some parts it is covered only by the skin. The upper head is flat, with slight depressions corresponding with the lower row of the bones of the knee. The lower head is differently and curiously formed. It resembles a double pulley. There are three elevations, the principal one in the centre, and one on each side; and between them are two slight grooves; and these so precisely correspond with deep depressions and slight prominencies in the upper head of the larger pastern, and are so enclosed and guarded, by the elevated edges of that bone, that when the shank-bone and the pastern are fitted to each other, they form a perfect hinge: they admit of the bending and extension of the limb, but of no lateral or side motion; which is a circumstance of very great importance in a joint so situated, and having the whole weight of the horse thrown upon it.

The smaller bones are placed behind the larger on either side; a slight projection only of the head of each can be seen in front. The heads of these bones are enlarged, and receive part of the weight conveyed by the lower row of the bones of the knee. They are united to the larger bone by the same kind of substance which is found in the colt between the bone of the elbow and the main bone of the arm; and which is designed, like that, by its great elasticity, to lessen the concussion or jar when the weight of the animal is thrown on them. They reach from one-half to two-thirds of the length of the shank-bone, and, through their whole extent, are united to it by this substance; but, as in the elbow, from the animal being worked too soon, or too violently, inflammation ensues, and bony matter is deposited in the room of the ligamentous; and a bony union takes place instead of the natural one. There is no doubt that the ease of motion is somewhat lessened by this substitution of bone, but other elastic principles are probably called into more powerful action, and the value of the horse is not perceptibly impaired; although it is hard to say what secret injury may be done to the neighbouring joints, and the cause of which, lameness appearing at a distant period, is not suspected.

In this process, however, mischief does often immediately extend to the neighbouring parts. The disposition to deposit bone reaches beyond the circumscribed space between the larger and smaller bones of the leg; and a tumour, first callous and afterwards bony, is found, with part of its base resting on the line of union between these bones. This is called a

SPLINT.

The splint is invariably found on the outside of the small bone, and generally on the inside of the leg (*c*, p. 255.) Why it should appear on the outside of the small bones it is difficult to explain, except that the space between these bones is occupied by an important mechanism, which will be presently described; and, as in the case of abscess, a natural tendency was given to them to determine outward, that vital parts may not be injured. The cause of their almost exclusive appearance on the inside of the leg admits of easier explanation. The inner splint-bone is placed nearer the centre of the weight of the body than the other, and, from the nature of its connexion with the bones of the knee, actually receives more of the weight than does the outer bone, and therefore is more liable to injury, and inflammation, and this consequent deposit of bone. The inner bone receives the whole of the weight transmitted to one of the small bones of the knee. It is the only support of that bone. A portion only of one of the bones rests on the outer splint-bone, and the weight is shared between it and the shank. In addition to this, it is the absurd practice of many smiths to raise the outer heel of the shoe to an extravagant degree, which throws still more of the weight of the horse on the inner splint-bone. These tumours occasionally appear on other parts of the shank-bone, being the consequence of violent blows, or other external injuries.

When the splint is forming, the horse is frequently lame. The periosteum or membrane covering the bone is painfully stretched; but when this membrane has accommodated itself to the tumour that extended it, the lameness subsides and altogether disappears, unless the splint be in a situation in which it interferes with the action of some tendon or ligament, or in the immediate neighbourhood of a joint. Pressing upon a ligament or tendon, it may cause inflammation of those substances; or, being close to a joint, it may interfere with its action. Splints, then, do not necessarily cause unsoundness, and may not lessen in the slightest degree the action or value of the horse. All depends on their situation. When we have described the situation and course of the suspensory ligaments, we shall be enabled to enter more fully into this.

The treatment of splints, if it be worth while to meddle with them, is exceedingly simple. The hair should be closely shaved off round the tumour; a little strong mercurial ointment rubbed in for two days; and this should be followed by an active blister. If the splint be of recent formation, it will usually yield to this, or to a second blister. Should it resist these applications, it can rarely be advisable to cauterize the part, unless the tumour interferes materially with the action of the suspensory ligament; for it not unfrequently happens, that, although the splint may have apparently resisted this treatment, it will afterwards, and at no great distance of time, begin rapidly to lessen, and quite disappear. There is also a natural process by which the greater part of splints disappear when the horse gets old.

As for the old remedies, many of them brutal enough,—bruising the splint with a hammer, boring it with a gimlet, chipping it off with a mallet, sawing it off, slitting down the skin and periosteum over it, sweating it down with hot oils, and passing setons over it,—the voice of humanity, and the progress of science, will consign them to speedy oblivion.

The inside of the leg, immediately under the knee, and extending to the head of the inner splint-bone, is subject to injury from what is termed the *speedy cut.* A horse with high action, and in the fast trot, violently strikes this part either with his hoof or the edge of the shoe. Sometimes bony enlargement is the result, at others great heat and tenderness; and the pain from the blow seems occasionally to be so great that the horse drops as if he were shot. The only remedy is to take care that no part of the shoe projects beyond the foot; and to let the inner side of the shoe, except the country be very deep, or the horse used for hunting, have but one nail, and that near the toe. This part of the hoof, being unfettered with nails, will expand when it comes in contact with the ground, and contract when in air and relieved from the pressure of the weight of the body; and, although this contraction is to no great extent, it will be sufficient to carry the foot harmlessly by the leg. Care should likewise be taken that the shoe be of equal thickness at the heel and the toe, and that the bearing be equal on both sides.

Immediately under the knee we find one of those ligamentous rings by which the tendons are so usefully bound down and secured; but if the hinder bone of the knee, the *trapezium*, described at p. 241, be not sufficiently prominent, this ring will confine the flexor tendons of the foot too tightly, and the leg will be very deficient in depth under the knee. This is called being *tied in below the knee.* (*b*, p. 255.) Every horseman recognizes it as a most serious defect. It is scarcely compatible with speed, and most assuredly not with continuance. Such a horse cannot be ridden far and fast without serious sprain of the back sinews. The reason is plain: the pressure of the ring will produce a degree of friction inconsistent with the free action of the tendons; more force must, therefore, be exerted in every act of progression; and, although the muscles are powerful, and sufficiently powerful for every ordinary purpose, the repetition of this extra exertion will tire and strain them. A more serious evil, however, remains to be stated. When the back sinews or tendons are thus tied down, they are placed in a more oblique direction, and in which the power of the muscles is exerted with greater disadvantage; and, therefore, both for extraordinary, and even ordinary action, a greater degree of exertion is required, and fatigue and sprain will frequently result. There are few more serious defects than this tying-in of the tendons immediately below the knee. The foreleg may be narrow in front, but it must be deep at the side, in order to render the horse valuable; for then only will the tendons have free action, and the muscular force be exerted in the most advantageous direction. The recollection of the reader will convince him, that there are few good race-horses whose legs are not deep below the knee. If there are exceptions, it is because their exertion, although violent, is but of short duration. The race is decided in a few minutes; and, during that little period, the spirit and energy of the animal may successfully struggle with the disadvantages of form; but where great and long-continued exertion is required, as in the hunter or the hackney, no strength can long contend against this palpably disadvantageous misapplication of muscular power.

As they descend the back part of the leg, the tendons of the perforated and perforating flexor muscle should be far and distinctly apart from the shank-bone. There should be space free from thickening for the finger and thumb on either side to be introduced between them and the bone, and that extending from the knee to the fetlock. In a perfect leg—and towards its lower part, there should be three distinct and perfect projections visible to the eye, as well as recognizable by the finger, the sides of the shank-bone, the most forward of the three; next, the suspensory ligament; and hindermost of all, the flexor tendons. When these are not to be distinctly seen or felt, or there is considerable thickening about them and between them; (*b*, p. 255) and the leg is round instead of flat and deep, there has been what is commonly, but improperly, called,

SPRAIN OF THE BACK-SINEWS.

These tendons are enclosed in a sheath of dense cellular substance, to confine them in their situation, and to defend them from injury. Between the tendon and the sheath there is a mucous fluid, to prevent friction: but when the horse has been overworked, or put to sudden and violent exertion, the tendon presses upon the delicate membrane lining the sheath, and inflammation is produced, and a different fluid is thrown out, which *coagulates*, and adhesions are formed between the tendon and the sheath, and the motion of the limb is more difficult and painful. At other times, from violent or long-continued exertion, some of the fibres which tie the tendons down are ruptured. A slight injury of this nature is called a sprain of the back-sinews or tendons; and when it is more serious, the horse is said to have *broken down.* It should be remembered, however, that the *tendon* can never be sprained, because it is inelastic and incapable of extension; and the tendon, or its sheath, are scarcely ever ruptured, even in what is called breaking down. The first injury is confined to inflammation of the sheath, or rupture of a few of the attaching fibres. The inflammation of the part, however, is often very great, the pain intense, and the lameness excessive. The anguish expressed at every bending of the limb, and the local swelling and heat, will clearly indicate the seat of injury.

In every serious affection of this kind, care should be taken that the local inflammation does not produce general disturbance of the system; and, therefore, the horse should be bled and physicked. The bleeding may be at the toe, by which an important local, as well as general effect, will be produced. The vessels of the part will be relieved, while fever will be prevented. Let not the bleeding be performed in the usual farrier's way of first paring down the sole, and then taking out a piece of it at the toe of the frog; in which case a wound is made often difficult to heal, and through which fungous granulations from the sensible parts beneath will obstinately spring: but after the sole has been well thinned, let a groove be cut with the rounded head of a small drawing-knife, at the junction of the sole and the crust (see *z* in the next cut, p. 249). The large vein at the toe will thus be opened, or the groove may be widened backward until it be found. When the blood begins to appear, the vein may be more freely opened, by a small lancet thrust horizontally under the sole, and almost any quantity of blood may be easily procured. The immersion of the foot in warm water will cause the blood to flow more rapidly. When a sufficient quantity has been drawn, a bit of tow may be placed in the groove, and the shoe tacked on. The bleeding will be immediately stopped, and the wound will readily heal.

As a local application, let no hot farrier's oil come near the part, but let the leg be well fomented with warm water two or three times in the day, and half an hour at each time; and, between the fomentations, let the leg be enclosed in a poultice of linseed-meal. Any herb that pleases the owner may be added to the fomentation, or vinegar or Goulard's extract to the poultice; but the beneficial effect of both depends simply on the warmth of the water and the moisture of the poultice. The first object which the surgeon has in view, is to abate the inflammation of the part, and no means are so likely as these to effect that purpose. Every stimulating application will infallibly aggravate the mischief.

The horse beginning to put his foot better to the ground, and to bear pressure on the part, and the heat having disappeared, the object to be accomplished is changed; recurrence of the inflammation must be prevented, the enlargement must be got rid of, and the parts must be strengthened. The two latter purposes cannot be better effected than by using an elastic bandage—one of thin flannel will be the best. This will sustain and support the limb, while by few means are the absorbents sooner induced to take up the effused coagulable matter of which the swelling is composed, than by moderate pressure. If the bandage be kept wet with vinegar, to each pint of which a quarter of a pint of spirit of wine has been added, the skin will be slightly stimulated and contracted, and the cold produced by the constant evaporation will tend to subdue the remaining and deep-seated inflammation. This bandage should be daily tightened in proportion as the parts are capable of bearing increased pressure, and the treatment should be persisted in for a fortnight: if, at the expiration of that period, there be no swelling, tenderness, or heat, the horse may gradually, and very cautiously, be put to his usual work.

Should there, however, remain the slightest lameness or considerable enlargement, the leg must be blistered; and, indeed, it would seldom be bad practice to blister after a case of severe sprain: for the inflammation lies deep in the sheath of the tendons, and the part once sprained long remains weak, and subject to renewed injury, not only from unusual, but even ordinary exertion. If the blister be resorted to, time should be given for it to produce its gradual and full effect, and the horse should be turned out for one or two months; and here we must be permitted to repeat, that a blister should never be used while any heat or tenderness remains about the part, otherwise the slightest injury may be, and often is, converted into incurable lameness.

Very severe sprains, but much oftener sprains badly treated, may require the application of the cautery. If from long-continued inflammation the structure of the part is materially altered, if the swelling is becoming callous, or the skin is thickened and prevents the free motion of the limb, no stimulus short of the heated iron will be sufficient to rouse the absorbents to remove the injurious deposit. The principal use of firing is to rouse the absorbents to such increased action that they shall take up and remove the diseased thickness of the skin, and likewise the unnatural deposit in the cellular substance beneath. The firing should be applied in straight lines, because the skin, contracting by the application of the cautery, and gradually regaining its elastic nature, will thus form the best bandage over the weakened part. Here, even more particularly than in the blister, time should be given for the full action of the firing. This removal of diseased matter is a work of slow progress. Many weeks pass away before it is perfectly accomplished; and, after firing, the horse should have at least a six months', and it would be better if he could be given a twelve months' run at grass. When the animal has been set to work in a few weeks, and the enlargement remains, or lameness returns, the fault is to be attributed to the impatience of the owner, and not to the want of power in the operation, or skill in the operator.

Farriers are apt to blister immediately after firing. A blister may be useful six weeks or two months after firing, if lameness remains; but can never be wanted immediately after the severe operation of the cautery. If the iron has been skilfully applied, subsequent blistering inflicts on the animal, already sufficiently tortured, much unnecessary and useless pain, and should never be resorted to by him who possesses the slightest feeling of humanity.

In examining a horse for purchase, the closest attention should be paid to the appearance of these flexor tendons. If there be any thickness of cellular substance around them, that horse has been sprained violently, or the sprain has not been properly treated. This thickening will probably fetter the motion of the tendon, and dispose the part to the recurrence of inflammation and lameness. Such a horse, although at the time perfectly free from lameness, will be regarded with suspicion, and cannot fairly be considered as sound. He is only patched up for a while, and will probably fail at the close of the first day's hard work.

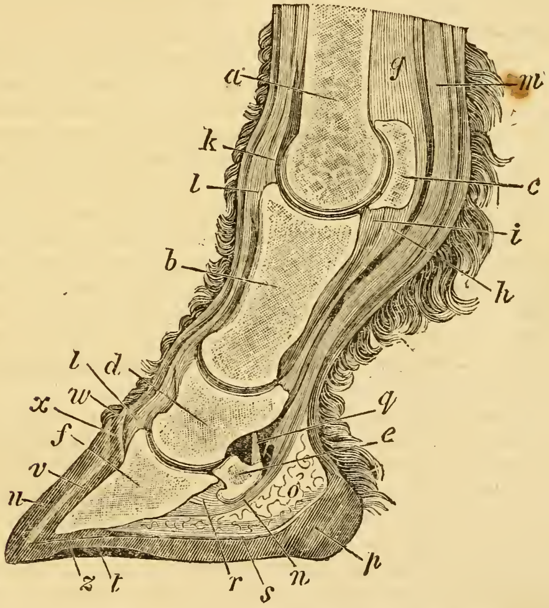
WIND-GALLS.

Approaching nearer to the fetlock, we occasionally find considerable enlargements, oftener on the hind leg than the fore one, which are denominated *wind-galls* (*e*, p. 255). Between the tendons and other parts, and wherever the tendons are exposed to pressure or friction, and particularly about their extremities, little bags or sacs are placed, containing and suffering to ooze slowly from them a mucous fluid. From undue pressure, and that most frequently caused by violent action and straining of the tendons, these little bags become injured; they take on inflammation, and they grow large and hard. The tendons are mostly inserted into the neighbourhood of joints, and there is most motion and pressure, and consequently these enlarged mucous bags (*bursæ mucosæ*) are oftenest found, about the joints. There are few horses perfectly free from them. When they first appear, and until the inflammation subsides, they may be accompanied by some degree of lameness; but otherwise, except when they attain an enormous size, they do not interfere with the action of the animal, or cause unsoundness. The farriers used to suppose that they contained wind—hence their name, wind-galls; and hence the practice of opening them, by which dreadful inflammation has often been produced, and many a valuable horse destroyed.

A slight wind-gall will scarcely be subjected to treatment; but if these tumours are numerous and large, and seem to impede the motion of the limb, they may be attacked first by bandage. The roller should be of flannel, and soft pads should be placed on each of the enlargements, and bound down tightly upon them. The bandage may be wetted with the lotion recommended for sprain of the back-sinews. The wind-gall will often diminish or disappear by this treatment, but will too frequently return when the horse is again hardly worked. A blister is a more effectual remedy; and firing still more certain, if the tumours be sufficiently large and annoying to justify our having recourse to measures so severe. In bad cases the cautery is the only cure, for it will not only effect the immediate absorption of the fluid, and the reduction of the swelling, but, by contracting the skin, will act as a permanent bandage, and therefore prevent the reappearance of the tumour.

THE PASTERNS.

At the back of the shank just below the knee, and in the space between the two splint-bones, are found two extraordinary and important ligaments, extraordinary as being elastic, and important as being admirably adapted to obviate concussion. They have their origin from the head of the shank-bone, and also from the heads of the splint-bones; then descending down the leg, they fill the groove between the splint-bones, but are not attached to either of them; a little lower down they expand on either side, and, approaching the pasterns, they divide, and are inserted into two little bones found at the back of the upper pastern, one on each side, called the *sessamoid* bones. (See p. 63, and in this cut which represents the pastern and foot, sawn through the middle.) They form a kind of joint both with the lower head of the shank-bone, and the upper pastern-bone, to both of which they are united by ligaments (*i* and *g*), but much more closely tied to the pastern than to the shank. The flexor tendons pass down between them through a large mucous bag to relieve them from the friction to which, in so confined a situation, they would be exposed. This ligament is continued over the sessamoids, and afterwards obliquely forward over the pastern to unite with the long extensor tendon, and downward to the perforated tendon, which it surrounds and fixes in its place, and also to the smaller pastern bone.



a The shank-bone.
b The upper and larger pastern-bone.
c The sessamoid-bone.
d The lower or smaller pastern-bone.
e The navicular or shuttle-bone.
f The coffin-bone or bone of the foot.
g The suspensory ligament inserted into the sessamoid-bone.
h A continuation of the suspensory ligament inserted into the smaller pastern-bone.
i The small inelastic ligament, tying down the sessamoid bone to the larger pastern-bone.
k A long ligament reaching from the pastern-bone to the knee.
l The extensor tendon inserted into both the pasterns and the coffin-bone.

m The tendon of the perforating flexor inserted into the coffin-bone, after having passed over the navicular bone.
n The seat of the navicular joint lameness.
o The inner or sensible frog.
p The cleft of the horny frog.
q A ligament uniting the navicular bone to the smaller pastern.
r A ligament uniting the navicular bone to the coffin-bone.
s The sensible sole, between the coffin-bone and the horny sole.
t The horny sole.
u The crust or wall of the foot.
v The sensible laminæ to which the crust is attached.
w The coronary ring of the crust.
x The covering of the coronary ligament from which the crust is secreted.
z Place of bleeding at the toe.

It will be easy to perceive, from this description of the situation of the suspensory ligament, why splints placed backward on the leg are more likely to produce lameness than those which are found on the side of the leg. They may interfere with the motion of this ligament, or, if they are large, may bruise and wound it.

The principal action of these ligaments is with the sessamoid bones, which they seem to suspend in their places, and they are therefore called the suspensory ligaments. The pasterns (see cut, p. 249) are united to the shank in an oblique direction, differing in degree in the different breeds of horses, and in each adapted to the purpose for which that breed was designed. The weight falls upon the pastern in the direction of the shank-bone, and the pastern being set on obliquely, a portion of the weight must be communicated to the sessamoids. Much jar is saved by the yielding of the pasterns, in consequence of their oblique direction; and the concussion which would be produced by that portion of weight which falls on the sessamoid-bones is completely destroyed, for there is no bone underneath to receive it. They are suspended by this ligament—an *elastic* ligament, which gradually yields to, and is lengthened by, the force impressed upon it, and in this gradual yielding and lengthening, all painful or dangerous concussion is rendered impossible.

If the ligament lengthens, the sessamoid-bones must descend when the weight is thrown on them, and it would appear that they do so. If the thorough-bred horse with his long pasterns is carefully observed as he stands, the tuft at the fetlock will be some inches from the turf; but when he is in rapid motion, and the weight is thrown violently on this joint, the tuft descends and sweeps the very ground. This, however, is the combined action of the fetlock and pastern-joints, and the sessamoid-bones. The sessamoids do not actually descend; but they revolve, they partly turn over. The strong ligament by which they are attached to the pastern-bone acts as a hinge, and the projecting part of the bone to which the suspensory ligament is united, turns round with the pressure of the weight; and so that part of the bone becomes lower. How is it raised again? This ligament, strangely constructed as a ligament, is elastic. It yields to the force impressed upon it, and lengthens; but as soon as the foot is lifted from the ground, and the weight no longer presses, and the force is removed, its elastic power is exerted, and it regains its former dimensions, and the sessamoid-bone springs back into its place, and by that forcible return assists in raising the limb*

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* Mr. Percivall very clearly describes this: ‘ Furthermore it seems to us that these elastic parts assist in the elevation of the feet from the ground in those paces in which

The length and obliquity of the pastern vary, we have said, in the different breeds of horses, and in proportion to the length and slanting direction of the pastern is the springiness of the horse and the easiness of his paces. The pastern must be long in proportion to its obliquity, or the fetlock would be too close to the ground, and, in rapid action, would come violently upon it. It is necessary that the fetlock should be elevated a certain distance from the ground, and this may be effected either by a short and upright, or a long and slanting pastern. In proportion as the pastern is oblique or slanting, two consequences will follow: less weight will be thrown on the pastern, and more on the sessamoid, and, in that proportion, jar or concussion will be prevented; and the jar of the weight which is thrown on the pastern will be lessened by the very obliquity of the bones, agreeably to what we have already stated of the angular construction of the limbs.

Every advantage has, however, to a certain extent, its corresponding disadvantages. In proportion to the obliquity or slanting of the pastern, will be the stress on the fetlock-joint, and, therefore, the liability of that joint to injury and strain; and also the liability to 'sprain of the back-sinews,' from the increased action and play of the flexor tendons; and likewise to injuries of the pastern-joints, for the ligaments will be weak in proportion to their length. The long and slanting pastern is an excellency in the race-horse, from the springiness of action and greater extent of stride by which it is accompanied. A less degree of it is necessary in the hunter who is to unite continuance of exertion with ease of pace, and who, in his leaps, requires almost as much springiness as the race-horse; but for the wear and tear of the hackney a still less degree of obliquity should be found. There should be sufficient to give pleasantness of going, but not enough to endanger continuance and strength. Experience among horses will alone point out the most advantageous direction of the pastern, for the purpose required; but the slightest observation will prove the necessity of considerable variety in the structure of this part. Let the reader imagine the heavy dray-horse with his short and upright pasterns, contending in the race; or the race-horse with his long and weak pasterns, endeavouring to dig his toe into the ground to move some heavy weight. The concussion is little in a cart-horse because his movements are slow, and therefore the upright and strong pastern is given to him, which he can force into the ground, and on which he can throw the whole of his immense weight. The oblique pastern is given to the race-horse because that alone is compatible with extent of stride and great speed. Except a horse for general purposes, and particularly for riding, be very hardly used, a little too much obliquity is a far less evil than a pastern too upright. The upright pastern is unsafe. The very circumstance which enables the dray-horse to throw himself into his collar, throws the riding-horse down; and while the jolting of the upright pastern is an insufferable nuisance to the rider, it is injurious to the horse, and produces many diseases in the feet and legs. A riding-horse, with upright pasterns, will soon begin to knuckle over, even with ordinary work; and this will be followed by ringbone, ossification of the cartilages, and contracted feet.

they are called into sudden and forcible action. The suspensory ligament, by its reaction, instantaneously after extension, aids the flexor-muscles in bending the pastern-joints. The astonishing activity and expedition displayed in the movements of the race-horse at speed, seem to be referable, in part, to the promptitude with which the suspensory ligament can act before the flexor-muscles are duly prepared; the latter, we should say, *catch*, as it were, and then direct the limb first snatched from the ground by the powers of elasticity.'—Percivall's Lectures on the Veterinary Art, vol. i., p. 334.

RUPTURE OF THE SUSPENSORY LIGAMENT.

The suspensory ligament is sometimes ruptured by extraordinary exertion. The sessamoids are then let down, and the fetlock almost touches the ground. This is generally mistaken for rupture of the flexor tendon; but one circumstance will sufficiently demonstrate that it is the suspensory ligament which is concerned, viz. that the horse is able to bend his foot. Rupture of this ligament is a bad, and almost desperate case. The horse is frequently lame for life, and never becomes perfectly sound. Keeping him altogether quiet, bandaging the leg, and putting on a high-heeled shoe, will afford the most probable means of relief.

THE FETLOCK.

The fetlock-joint is a very complicated one, and from the stress which is laid on it, and its being the principal seat of motion below the knee, it is particularly subject to injury. There are not many cases of sprain of the back-sinew which are not accompanied by inflammation of the ligaments of this joint; and many supposed cases of sprain higher up are simple affections of the fetlock. It requires a great deal of care, and some experience, to distinguish the one from the other. The heat about the part, and the point at which the horse least endures the pressure of the finger, will be the principal guides. An affection of the fetlock-joint demands blistering more promptly and severely than one of the sheaths of the tendons.

GROGGINESS.

The peculiar knuckling over of the fetlock-joint, and tottering of the whole of the fore-leg, known by the name of *grogginess*, and which is so often seen in old and over-worked horses, is seldom an affection of either the fetlock or the pastern-joints simply, although these have their full share in the mischief that has been produced by tasking the poor animal beyond his strength. Sometimes it is difficult to fix on any particular joint; at others, it seems to be traced to a joint deep in the foot, where the flexor tendon runs over the navicular bone. It seems oftenest to be a want of power in the ligaments of the joints generally, produced by frequent and severe sprains, or by ill-judged and cruel exertion; and, in the majority of cases, admits of no remedy; especially as dissection often discovers ulceration within the joints, and of the membrane which lines the cartilage, and even of the cartilage itself, which it was impossible to reach or to remove.

CUTTING.

The inside of the fetlock is often bruised by the shoe or the hoof of the opposite foot. Many expedients have been tried to remove this; the inside heel has been raised and lowered, and the outside raised and lowered; and sometimes one operation has succeeded, and sometimes the contrary; and there was no point so involved in obscurity, or so destitute of principles to guide the practitioner. The most successful remedy, and that which in the great majority of cases supersedes all others, is to put on a shoe, of even thickness from heel to toe; to let the bearing be perfectly level; and then to drive but one nail, and that near the toe, in the inside of the shoe, which is placed on the foot by which the injury is done; care being taken that the shoe shall not extend beyond the edge of the crust, and the crust being rasped a little at the quarters. The principle on which this shoe acts has been stated when we spoke of the speedy cut. There are some defects, however, in the natural form of the horse, which are the causes of cutting, and which no contrivance will remedy; as when the legs are placed too near each other, or when the feet are turned inward or outward. A horse with these defects should be carefully examined at the inside of the fetlock, and if there be any sore or callous places from cutting, there will be sufficient reason for rejecting the animal. Some horses will cut when they are fatigued, and many colts will cut before they arrive at their full strength.

Fig. 1.

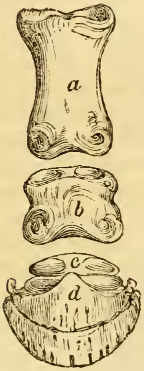


Fig. 2.

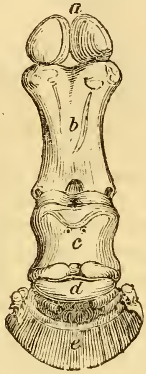


Fig. 1.

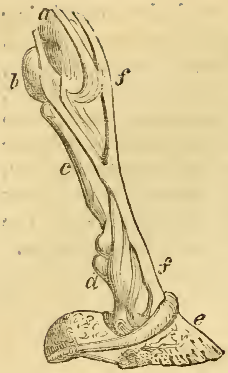
a The upper pastern.
b The lower pastern.
c The navicular bone.
d The coffin-bone.

Fig. 2.

a The sessamoid-bone.
b The upper pastern.
c The lower pastern.
d The navicular bone.
e The coffin-bone, with the horny laminæ.

The *upper pastern* bone (*b*, p. 249, and *a* in the first figure, and *b* in the second in this cut) receives the lower pulley-like head of the shank-bone, and forms a hinge-joint admitting only of bending and extension, but not of side motion; it likewise articulates with the sessamoid-bones. Its lower head has two rounded protuberances, which are received into corresponding depressions in the lower pastern. On either side, above the pastern-joint, are roughened projections for the attachment of very strong ligaments, both the capsular ligaments, and many cross ligaments, which render the joint between the two pasterns sufficiently secure.

The *lower pastern* (*d*, p. 249, and *b* in the first figure, and *c* in the second in this cut) is a short and thick bone, with its larger head downward. Its upper head has two depressions to receive the protuberances on the lower head of the upper bone, bearing some resemblance to a pulley, but not so decidedly as the lower head of the shank-bone. Its lower head resembles the lower head of the other pastern, and has two prominences, likewise somewhat resembling a pulley, and by which it articulates with the coffin-bone; and a depression in front, corresponding with a projection in the coffin-bone; and also two slight depressions behind, receiving eminences in the navicular bone. Neither of these joints admit of any lateral motion. The ligaments of this joint, which is called the coffin-joint, are, like those of the pastern-joint, exceedingly strong, both the capsular and the cross ones. The tendon of the extensor muscle is inserted into the fore part, both of the upper and lower pastern-bones, as well as into the upper part of the coffin-bone (*l*, p. 249); and at the back of these bones the suspensory ligament is expanded and inserted, while a portion of it goes over the fore part of the upper pastern to reach the extensor tendon. These attachments in front of the bones are seen in the accompanying cut, in



which *a* represents the lower part of the shank-bone ; *b* the sessamoid-bones ; *c* the upper pastern ; *d* the lower pastern ; and *e* the coffin-bone ; *f* are the branches of the suspensory ligaments going to unite with the extensor tendon ; *g* the long extensor tendon ; *h* ligaments connecting the two pastern-bones together ; and *i* the lateral cartilages of the foot. And now, having arrived at the foot, which is the most complicated and important part in the frame of a horse, we shall defer the consideration of the coffin and navicular bones until we have described the hinder extremities. We may, however, observe that both these joints are subject to sprain, and particularly the coffin-joint.

SPRAIN OF THE COFFIN-JOINT.

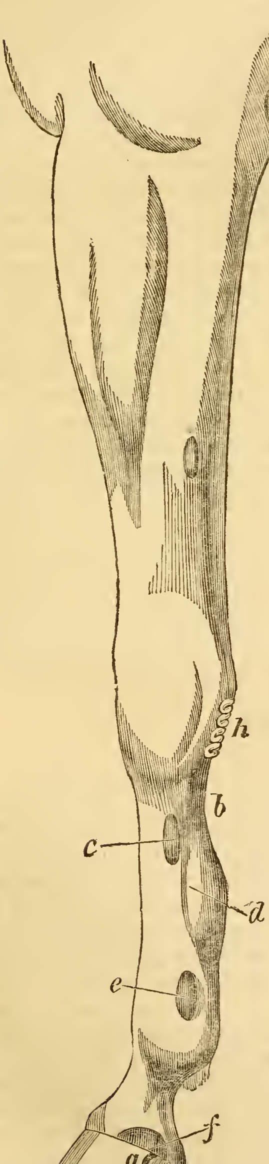
The proof of this is when the lameness is sudden, and the heat and tenderness are principally felt round the coronet. Bleeding at the toe, physic, fomentation, and blisters are the usual means adopted. This lameness is not easily removed, even by a blister ; and if removed, like sprains of the fetlock and of the back-sinews, it is apt to return, and, finally, produce a great deal of disorganization and mischief in the foot. This wrick, or sprain of the coffin-joint, sometimes becomes a very serious affair, not being always attended by any external swelling, and being detected only by heat round the coronet, the seat of the lameness is often overlooked by the groom and the farrier ; and the disease is suffered to become confirmed before its nature is discovered. There is no species of lameness more confounded with affections of the shoulder than this, because it is the custom of these ignorant and prejudiced persons to trace every lameness to the shoulder which is not palpably referable to another part.

From violent or repeated sprains of the pastern or coffin-joints, or extension of the ligaments attached to other parts of the pastern-bones, inflammation takes place in the periosteum, and bony matter is formed, which often rapidly increases, and is recognised by the name of

RINGBONE.

Ringbone commences in one of the pasterns, and usually about the pastern-joint, but it rapidly spreads, and involves not only the pastern-bones, but the cartilages of the foot. When the first deposit is on the lower pastern, and on both sides of it, and produced by violent inflammation of the ligaments of the joints, it is recognised by a slight enlargement, or bony tumour on each side of the foot, and just above the coronet. (See *f* in the following cut.) This is more frequent in the hind foot than the fore, because, from the violent action of the hind legs in propelling the horse forward, the pasterns are more subject to ligamentary injury behind than before ; yet the lameness is not so great, because the disease is confined principally to the ligaments, and the bones have not been injured by concussion ; while from the position of the fore limbs and their exposure to concussion, there will generally be in them injury of the bones to be added to that of the ligaments. In its early stage, and when recognised only by a bony enlargement on both sides of the pastern-joint, or in some few cases on one side only, the lameness is not very considerable, and it is not impossible to remove the disease by active blistering, or by the application of the cautery : but there is so much wear and tear in this part of the animal, that the inflammation and the disposition to the formation of bone rapidly spread The pasterns first become connected together by bone instead of ligament, and thence results what is called an anchylosed or fixed joint. Its motion is lost. From this joint the disease proceeds to the cartilages of the foot, and to the union between the lower pastern, and the coffin and navicular bones; and the motion of these parts likewise is impeded or lost, and the whole of this part of the foot becomes one mass of spongy bone. From this disposition to spread, (and at first round the pastern-joint, which is situated just above the coronet,) this disease has acquired the name of ringbone.

CUT OF THE LEG.



This cut will show the situation and appearance of this and some other defects of the fore-leg. *a* will represent the capped hock or enlargement of the joint of the elbow; *b* the tying-in of the leg below the knee; *c* the most frequent situation of splint on the side of the shank-bone, and not producing lameness after its first formation, because it does not interfere with the motion of the knee, or injure the suspensory ligament. *d* is the situation and appearance of the enlargement accompanying sprain of the back-sinews. This, however, is an aggravated case; and the sprain may be great, and the lameness distressing, without all this swelling. *e* is the place of wind-gall. *f* gives the appearance of ringbone, when it first appears on the side of the pastern, about the joint, and where there is naturally some prominence of bone; *g* is the situation of sand-crack in the fore-leg. *h* the situation of the mollenders.

Ringbone is one of the most serious lamenesses with which the horse can be afflicted. It is unsoundness when existing in the slightest degree, for the lateral enlargement may speedily extend; and when the bony deposit begins to spread, the disease is incurable.

The fore-legs, when viewed in front, should be widest at the chest, and should gradually approach to each other as we descend towards the fetlock. The degree of width must depend on the purpose for which the horse is wanted. The legs of a heavy draught-horse can scarcely be too far apart. His rounded chest enables him to throw more weight into the collar; and being seldom, if ever required for speed, he wants not that occasionally increased expansion of chest which the circular form is not calculated to give. A hunter, a hackney, and a coach-horse, should have sufficient expansion of the chest, or the legs sufficiently wide apart, to leave room for the play of the lungs; but depth more than roundness of chest is here required, because the deep chest admits of most expansion, when the horse, in rapid action, and the circulation proportionally quickened, needs more room to breathe: yet if the breast be too wide, there will be considerable weight thrown before, and the horse will be heavy in the hand, and unsafe.

Whether the legs are near to each other or wide apart, they should be straight. The elbow should not have the slightest inclination inward or outward. If it inclines towards the ribs, its action will be confined, and the leg will be thrown outward when in motion, and describe a curious and awkward curve; and this will give a peculiar rolling motion, unpleasant to the rider and unsafe to the animal. The toe will likewise be turned outward, which will not only prevent the foot from coming flat on the ground in its descent, but be usually accompanied by cutting, even more certainly than when the toe turns inward. If the elbow is turned outward, the toes will necessarily be turned inward, which is a great unsightliness, and to a certain degree injurious. The weight cannot be perfectly distributed over the foot; the bearing cannot be true; there will be undue pressure on the inner quarter, a tendency to unsafeness, and a disposition to splint and corn. The legs should come down perpendicularly from the elbow. If they incline backward and under the horse, there is undue stress on the extensor muscles; and the legs being brought nearer the centre of gravity, undue weight is thrown forward, and the horse is liable to knuckle over and become unsafe; if the legs have a direction forward, the flexor muscles are strained, and the action of the horse is awkward and confined. The toe should be found precisely under the point of the shoulder. If it be a little more forward, the horse will probably be deficient in action; if it be more under the horse, unsafeness will be added to still greater defect in going.

CHAPTER XIV.

THE HIND LEGS.

THE HAUNCH.

In describing the hinder extremities, we must begin with the bones of the haunch. The haunch (see O, p. 63, and the cut, p. 230) is composed of three bones. The first is the ilium, principally concerned in the formation of the haunch. Its extended branches behind the flanks are prominent in every horse; and when they are more than usually wide, the animal is said to be *ragged-hipped*. A branch runs up to the spine at the commencement of the sacral vertebræ E, and here the haunch-bones are firmly united with the bones of the spine. The ischium, or hip-bone, is behind and below the ilium. Its tuberosities or prominences are seen under the tail, (cut, p. 63). The pubis unites with the two former below and behind.

From the loins to the setting on of the tail, the line should be carried on almost straight, or rounded only in a very slight degree. Thus the haunch-bones will be most oblique, and will produce a corresponding obliquity, or slanting direction in the thigh-bone—a direction in which, as we stated when describing the fore-legs, the muscles act with most advantage. This direction of the haunch is characteristic of the thorough-bred horse; and, by the degree in which it is found, we judge as much as by anything of the breeding of the animal. If the bones at D and E, p. 63, took a somewhat arched form, as they do in the cart-horse, it is evident that the bone O must be more upright, the thigh-bone P would likewise be more upright, the stifle Q would not be so far under the body, and the power of the horse would be considerably impaired. The oblique direction of the haunch and thigh-bones, produced by the straightness of the line of the spine, does not, as is commonly supposed, afford increased surface for the attachment of muscles, but places the muscles in a direction to act with great advantage. It is in the advantageous direction, quite as much as in the bulk of the muscle, that the strength of the horse consists. It will be seen, from our cuts, that the angles formed by the fore and hind extremities have different directions. One points forward, and the other backward. We should expect this; for thus the action of the fore-legs least interferes with the chest, and that of the hind legs with the belly.

Width of haunch is a point of great consequence, for that actually affords more room for the attachment of muscles; and even though it should be so great as to subject the horse to the charge of being *ragged-hipped*, and may somewhat offend the eye, it is no detriment to action. If the loins be broad, and the horse be well ribbed home, the protuberances of the ilium can scarcely be too far apart. Many a ragged-hipped horse has possessed both fleetness and strength, but few which were narrow across the haunch could boast of the latter quality.

The opening through the centre of these bones, which constitutes the passage through which the young animal is expelled from the mother, is large in the mare, and in every quadruped, because there cannot be, from the form of the animal, any danger of abortion from the weight of the fœtus pressing on the part.

The only parts of these bones exposed to injury or fracture are the tuberosities or prominences of the haunch. A fall or blow may chip off and disunite a portion of them. There are no means of forcibly bringing the disunited parts together, and retaining them in their natural position. Nature, however, will cause them to unite, yet generally attended by deformity and lameness. A *charge*, or very strong adhesive plaister, across the haunch may be useful, as helping, in some slight degree, to support the parts, and hold them together.

THE THIGH.

In the lower and fore part of the hip-bones is a deep cavity or cup for the reception of the head of the upper bone of the thigh *. Although in the action of the hind legs there cannot be the concussion to which the fore-legs are exposed (for the weight of the body is never thrown violently upon them), yet in the powerful action of these limbs there is much strain on the joints, and we shall find, therefore, that there are, in all of them, admirable provisions against injury. The head of the upper bone of the thigh is received into a deep cup (the *acetabulum*), by which it is surrounded on every side, and dislocation from which would seem almost impossible. But the bony cup may give way? No! provision is made against this: all three of the haunch bones unite in the formation of this cup, and the sutures by which these bones are held together are of such a nature, that one would think no shock, or exertion, or accident, could disunite them. There is even something more added to make the attachment doubly sure. Besides the usual capsular and other ligaments, a singularly strong one rises from the base of the cup, and is inserted into the head of the upper bone of the thigh, and would seem to render separation or dislocation altogether impossible: and yet such is the amazing power of the muscles of the hind limb, that with all these attachments, sprain of the ligaments of the haunch joint, or the *round bone*, as horsemen call it, and even dislocation of the head of the thigh-bone, are occasionally found.

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* This, although the true thigh-bone, is so concealed by thick muscles, and seemingly by the continuation of the carcass, that its situation and shape are not visible to the eye; and it is generally overlooked by horsemen, who call the next bone extending from the stifle to the hock, the thigh: therefore, to render ourselves intelligible, we term this the *upper bone of the thigh.*

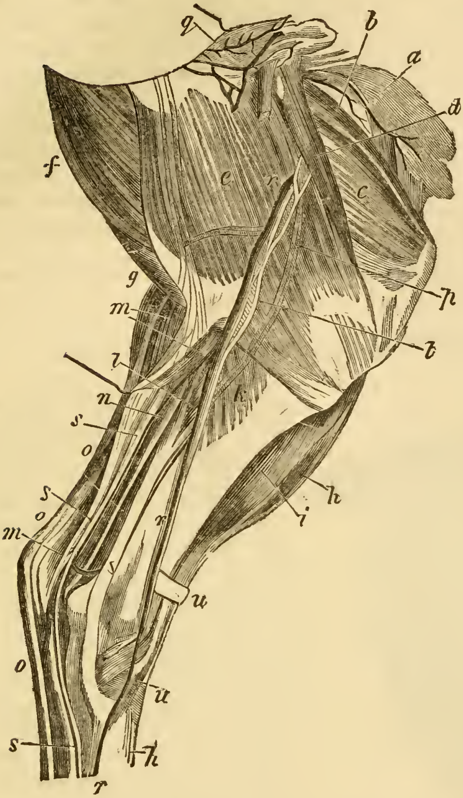
The upper bone of the thigh we should expect to be, from the powerful muscles that are attached to it, a very strong bone, and it is both the largest and strongest in the frame. It is short and thick, and exhibits the most singular prominences, and roughnesses, and hollows, for the insertion of the immense muscles which belong to it. Four prominences, in particular, called by anatomists *trochanters*, two on the outside, one on the inside, and one near the head of the bone, afford attachment to several important muscles. The head of the bone is placed at right angles with its body, by which this important advantage is gained, that the motion of the thigh-joint is principally limited to that of bending and extending, although it possesses some slight lateral, and even some rotatory or round action. The lower head of the upper bone of the thigh is complicated in its form. It consists of two prominences, which are received into corresponding depressions in the next bone, and a hollow in front, in which the bone of the knee plays as over a perfect pulley.

A short description of the muscles of the hinder extremities may not be uninteresting to the horseman. The next cut will give a few of them.

The muscles of the hind extremity are more powerful in action than those of any other part of the frame, therefore there is a provision made to hold them down in their respective situations, and thus contribute to their security and strength. When the skin is taken from the hind limb, we do not at once arrive at the muscles, but they are thickly covered by a dense, strong, tendinous coat, which reaches over the whole of the haunch and thigh, and only ceases to be found at the hock where there are no muscles to be confined. If the power of the muscles be sufficient to dislocate and fracture the thigh-bone, they need the support and confinement of this tendinous coat. When this tendinous band is dissected off, another is found beneath, which is represented at *a*, raised and turned back, larger than the former, thicker and more muscular. It proceeds from the haunch-bones to the stifle, upon the fore and outer part of the haunch and thigh, and is intended to tighten and strengthen the other.

Under the part of this flat and binding muscle, which is represented in our cut as raised, is a large round muscle proceeding from the ilium, not far from the cup which receives the upper bone of the thigh, and running straight down this bone, and thence its name *rectus*, it is inserted into the bone of the stifle. An inspection of the cut, p. 63, will shew that it is so situated as to be enabled to exert its great power in the most advantageous way. It is a very prominent muscle, and forms what we may term the edge of the thigh forward. It terminates in a tendon, which is short and very strong, and which is, before its insertion into the patella, united with the prolongation of the tendinous substance at *g*, in the cut, p. 260, and also with the tendon of the muscle at *i*, in that cut, and at *c*, in the following cut, and which is properly called *vastus*, from its great bulk. Some have divided this into two

CUT OF THE MUSCLES OF THE INSIDE OF THE THIGH.



muscles, the external and internal. They proceed, the external from the outer surface of the upper bone of the thigh; the internal from the inner surface; and are inserted into the upper part of the bone of the stifle, both on the inner and outer side. These muscles act at considerable mechanical disadvantage; they form a very slight angle, not at all approaching to a right angle; but they are muscles of immense size, and occupy all the fore part of the thigh, from the stifle upwards. They are powerful extensors of the thigh, and of the hinder leg generally, for they are all inserted into the bone of the knee, and that is connected by strong tendons with the bone of the true leg. We shall have more to say of the action of this muscle when we have described the bone of the knee.

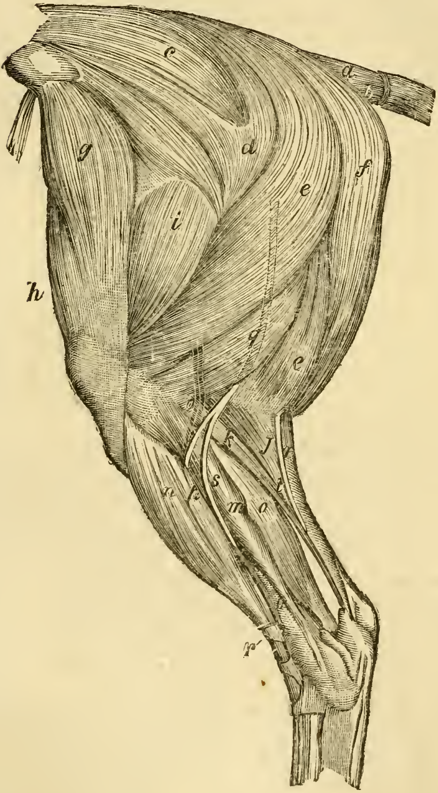
On the inside of the thigh are several other large fleshy muscles, as distinct to the eye as these, and which will be recognized after the slightest observation of the thigh of the living horse. First, we have a long, narrow, prominent muscle, the *sartorius*, or tailor's muscle, enabling him to sit cross-legged, *d*, arising from the edge of the haunch-bone, about half way down it, and inserted into the inner and upper part of the lower bone of the thigh, for thus we call this bone extending from the stifle to the hock, and which in the human being would be properly the leg. It bends the leg, and turns it inward, not useful in the latter case in progression, but in many of the natural actions of the horse.

Next comes a broad thin muscle, *e*, which cannot be mistaken, occupying the greater portion of the surface of the inner part of the thigh, and particularly the prominent part of it. It is called the *gracilis*, or slender muscle. It arises from the lower part of the haunch-bone, and, in its passage downward, uniting with the last muscle, is inserted with it into the inner and upper part of the lower bone of the thigh. It also turns the leg. If its direction be considered, it acts with evident advantage; but its insertion into the bone of the lower bone of the thigh is very disadvantageous. It applies its power very close to the joint or centre of motion, and the weight, consisting of the whole limb, and which may be supposed to be concentrated about its middle, is far distant.

Still, on the inside of the thigh, and forming the posterior edge of the thigh inwards, and contributing much to its bulk, is another of the principal muscles of the thigh, *f*, proceeding from the first bones of the tail, from the tuberosity of the ischium, and from the tendinous expansion which we have described, and principally inserted into the upper and fore part of the upper bone of the thigh, but a portion of it going to the head of the lower bone. That part which goes to the upper bone of the thigh acts with very great mechanical advantage (see cut, p. 65), and most powerfully bends the thigh on the pelvis, and lifts and extends the limb. It is one of the most effectual of the extensor muscles. Considering the weight of limb which it has to raise and extend, it had need to possess great power. At *g* is another muscle, concerned in the same office.

We now turn to some of the muscles which are very evident to the eye on the outside of the thigh.

CUT OF THE MUSCLES OF THE OUTSIDE OF THE THIGH.



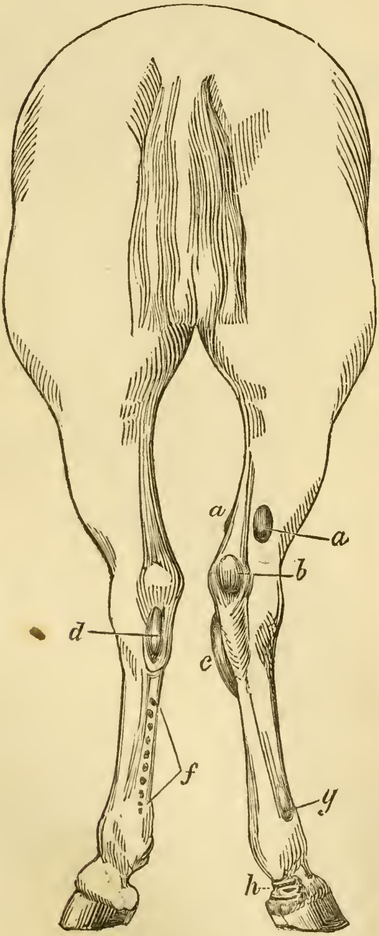
First is the outer *Glutæus*, or buttock muscle, *d*, being little more than a fleshy slip attached to the muscle next to be described. It arises as high up as the spine. It runs along the back part of the thigh in the form of a ridge, and is inserted into the smaller outer prominence of the upper bone of the thigh. Next is the *great glutæus* muscle, arising from the spinous and transverse processes of several of the bones of the loins, and from the sacrum, and from the different edges of the ilium, and inserted into the great protuberance of the upper bone of the thigh (page 63), behind and a little above the joint that unites the thigh to the haunch-bone. It is seen at *c*, in this cut; constitutes the upper and outer part of the haunch, and gives that fulness and roundness to it, which good judges so much admire in the quarters of the horse. It is one of the main instruments in progression. When the thigh has been brought forward under the body by the muscles already described, the plain action of these glutæi muscles is to extend the haunch, and force or project the body onward. To effect this they must be very powerful, and therefore they are so large, and rise from such an extensive surface; and they ought to act at great mechanical advantage, and so, in one sense, they do: springing from the loins and ilium and the sacrum, they act almost in a right or perpendicular line; in that line in which we have seen that the greatest power is gained. A reference to the plate of the skeleton will place this in a striking point of view; and this advantage is the more necessary, because, as is almost uniformly the case, there is a corresponding disadvantage to be overcome. These muscles are inserted into the great trochanter or protuberance of the upper bone of the thigh, and that is but a very little way removed from the joint or centre of motion. The power is close to the centre of motion; the weight supposed to be concentrated in the middle of the limb, is far off. It is more than 30 times as far as the power, and this muscle must act with a disadvantage of more than 30 to 1: or, if the hinder extremity, and the weight of the trunk above amount to six hundred pounds, the force applied, or the power of the muscle, must be equal to 30 times 600, or 18,000 pounds. The numerous origins of these muscles, and the extensive surfaces whence they arise, and their immense bulk, render them equal to this; and then, as we have demonstrated with regard to the flexor muscles of the arm, what is lost in power is gained in velocity; for while this portion of the upper thigh bone moves rapidly through a certain space, by the powerful contraction of the glutæi and other muscles, the extremity of that bone moves through thirty times the space, and the extremity of the whole limb or the foot moves through more than 100 times that space, and hence results, and hence only could result the speed of the horse.

Now comes another consideration;—in proportion as this protuberance behind and above the joint is lengthened, so is the shorter arm of the lever lengthened, and so is power or muscular exertion spared. This protuberance is lengthened in proportion to the length of the croup, and the depth of the quarters, and hence the importance of this conformation. We have explained this as it regards the depth of the elbow. It holds more especially good here, because these are the parts with which the speed and power of the horse are most concerned. The quarters commence, by the common consent of sporting men, from about the middle of the back, and extend to the hock downward, and to the tail behind; and although little regarded by those who are unaccustomed to horses, and the just proportions of those parts understood but by few who pretend to know the horse, the quarters are by far the most important points in his frame. Their muscularity will indicate power, and the depth of the quarters the proper direction and the advantageous action of that power.

These is another and smaller *glutæus* muscle under that we have last described, arising likewise from the back of the ilium, and inserted into the same protuberance of the thigh bone, and assisting in the same office. It is not visible in our cut. There are also several other muscles proceeding from different parts of the haunch bones, and inserted about the heads of the upper thigh bone, and performing the same work; but there are two muscles to which we must particularly refer. The first occupies the outer part of the quarter behind, and is beautifully developed in the blood horse; it is found at *e*, p. 260. It arises high up from the bones of the spine, from others at the root of the tail, from the protuberances of the ischium (vide cut, p. 63), and from other bones of the pelvis. It in fact consists of three muscles, but is usually described as one muscle with three heads, Triceps femoris (the three-headed muscle of the thigh). It is inserted into the upper part of the lower bone of the thigh, and its office is the same as the last, to draw back the thigh when placed under the trunk, and by so doing urge forward the body. Being inserted nearly in a perpendicular direction, it has great power, but that power is employed disadvantageously, on account of being placed so near the joint or centre of motion.

The muscle at *f*, descending likewise from the sacrum, and from the first bones of the tail, runs down posterior to the last muscle, and forms the hinder border of the haunch. It is inserted into the lower bone of the thigh, and assists in performing the same kind of motion. All these muscles are particularly prominent in the thorough-bred horse, and are the source of his strength and speed; and hence another very important point in the horse. These muscles, to perform their full action, should be so developed, that the horse, when the observer stands behind him, although wide enough at the loins and haunch, should yet be perceptibly wider at the thighs. The following cut, containing one excellence above, and many defects below, will illustrate our meaning.

CUT OF THE HAUNCH AND HIND LEGS.



STRAIN OF THE ROUND BONE.

The joint of the upper bone of the thigh with the haunch is commonly called the *whirl* or *round* bone. It has been stated, that it has, in some rare instances, been dislocated and fractured: it is, however, much oftener sprained, but not so often as the groom or farrier imagine. There is nothing peculiar in the lameness to detect injury of this part, except that frequently the horse will drag his leg after him on the toe. Injury of the round bone, or hip joint, will be principally discovered by heat and tenderness in the situation of the joint. A part so deeply seated is treated with difficulty. Fomentations should first be used to abate the inflammation, and after that an active blister should be applied. Strains of this joint are not always immediately relieved, and the muscles of the limb considerably waste; and therefore it may be necessary to repeat the blister, while absolute rest should accompany every stage of the treatment. It may even be requisite to fire the part, or, as a last resort, a *charge* may be put over the joint, and the horse turned out for two or three months.

THE STIFLE.

The upper bone of the thigh is united to the lower by a somewhat complicated joint. It terminates by two round prominences behind, which are received into slight depressions on the upper surface of the lower bone; and in front is a curious groove over which plays a small irregular bone, the patella or stifle bone. The whole is called by farriers the stifle joint. The patella (Q, p. 63) answers to the kneepan in the human subject. Some of the tendons of the strongest muscles of the upper bone of the thigh are inserted into it, and continued from it over the lower bone. This important joint is hereby much strengthened; for the proper ligaments between the upper and lower bones, and these additional tendons and ligaments from the patella, must form altogether a very powerful union. The patella likewise answers another and even more important purpose. The tendons of some strong muscles are inserted into it. When these muscles are not in action, the patella lies in the groove which nature has contrived for it; but when they begin to contract, it starts from its partial hiding-place, becomes prominent from the joint, and alters the line of direction in which the muscles act: it increases the angle, and thus very materially increases the power of the muscles.

The lower bone of the thigh is double: the larger portion, in front, extending from the stifle to the hock, is called the tibia. The smaller bone, or fibula, behind, see R, p. 63, reaches not more than a third of the way down. It is united to the shank bone, like the splint bone, by a cartilaginous substance, which soon is changed for bone. Of the use of these little bones we cannot speak

The lower bone of the thigh forms an angle with the upper, the reverse of that which exists between the upper bone and the pelvis. The object of this is twofold,—to obviate concussion, and to give a direction to the muscles favourable to their powerful action; and in proportion to the acuteness of the angle, or the degree in which the stifle is brought under the horse, will these purposes be accomplished. There is a great deal of difference in this in different horses, and the construction of this part of the frame is a matter worthy of more regard than is generally paid to it.

This part of the thigh should likewise be long. In proportion to the length of the muscle is the degree of contraction of which it is capable; and in proportion to the contraction of the muscle is the extent of motion in the limb: but it is still more necessary that this part of the thigh should have plenty of muscle, that strength may be added to this extent or compass of motion. We should not expect much endurance from a horse with a thin arm: a horse with thin and lanky thighs cannot possibly be good for anything. In our cuts, p. 259 and 260, the principal muscles of this part of the thigh are delineated. They are usually somewhat prominent, and may readily be traced in the living animal: a very brief notice of them may not be uninteresting.

We will first take the external ones, beginning in front. The continuation from g, p. 260, is the tendinous expansion given to bind and strengthen these muscles.

n is a very important muscle: it is the principal extensor muscle of the hind-leg (*extensor pedis*, extensor of the foot). It arises from the lower part of the upper bone of the thigh, and from the upper part of the lower bone. It is a strong, round, fleshy muscle: a little before it reaches the hock it will be seen to assume a tendinous form. It is covered and defended by a sheath of its own; and the cut will show the bands by which it is tied down in its place, within which it plays. It is seen continuing its course on the front of the cannon or shank bone. Having arrived at the fetlock joint, it begins to expand, and is finally inserted into the upper part of the coffin-bone, or bone of the foot, after having given various fibres to both the pasterns. The course of the corresponding tendon in the fore-leg is given in the cut, p. 249, fig. *l*.

At *m*, p. 260, is another of the extensor muscles, called the *peronæus*, from a name given to the fibula. It arises from the whole course of the fibula, and also becomes tendinous before it reaches the hock. About half way down the shank it is found in the same sheath with the principal extensor muscle, and is inserted with it into the coffin-bone. The office of the extensor muscles is to raise the foot from the ground, and to bring it forward under the body.

At *o* is the *flexor pedis*, one of the principal flexor (bending) muscles of the foot, arising from the upper part of the tibia. As it approaches the hock it is distinguished by its large round tendon, which is seen to enter into a groove at the back of the hock. It is continued down the back of the leg like a similar muscle in the fore-leg, is the perforating flexor muscle of the hind-leg, and assists in bending the pastern and coffin oints.

k is a very slender muscle, arising from the head of the fibula, and proceeding over the external part of the thigh, and, just above the hock, uniting with the tendon of the perforating muscle.

j is a very powerful muscle, springing from the head of the upper bone of the thigh, and, midway down the lower bone of the thigh, ending in a flat tendon, which is inserted into the point of the hock. Its use is to extend the hock. It is evidently most advantageously situated for powerful action; for it acts almost at right angles, and its effect is increased in proportion to the projection of the point of the hock.

We will now turn to the inner side. See cut, p. 259.

m gives a portion of the muscle which we have just described.

n an inside view of the perforating flexor muscle of the foot.

l is the peronæus.

o is the perforated flexor tendon, having its origin from near the lower head of the upper bone of the thigh; becoming tendinous as it passes down the thigh; expanding over and surrounding the point of the hock, and assisting in extending it; and then pursuing its course down the posterior part of the leg, in a manner so much resembling that of similar tendons in the fore-leg, that we shall content ourselves with referring to a description of the perforated and perforating flexor tendons at page 239.

At *e* is a continuation of the gracilis muscle, p. 259, over the stifle.

At *h* is the extensor pedis already described, p. 263, with its tendon.

At *i* is a muscle used to bend the hock, the *flexor metatarsi*, or bender of the leg; arising from the lower part of the upper bone of the thigh, and inserted into the upper part of the shank-bone; and also the inner small splint-bone. It is a muscle of considerable power, although disadvantageously situated, both as to its direction and its being inserted so near to the joint.

At *k* is a short muscle extending from the upper to the lower thigh-bones (the *poplitæus*), bending the stifle and turning the limb inward.

These cuts represent the situation of some of the principal blood-vessels and nerves of the hind extremities.

In the cut of the inside of the thigh, page 259, *p* represents the course of the principal artery; at *q* are blood-vessels belonging to the groin; at *r* is the large cutaneous vein, or the vein immediately under the skin. The principal nerves on the fore-part of the inside of the thigh pursue their course at *t*, in the direction of the cutaneous vein; and those of the posterior part are seen at *s*, and at *u* are those important ligamentous bands at the bending of the hock which confine the tendons.

In the cut of the outside of the thigh, page 260, *p* will give the course of the anterior arteries and veins; *q* the course of the principal nerves, and coming into sight below; and *r* the bands described in the former plate.

Also, in the cut of the outside of the shoulder and arm, p. 233, the figures 1, 2, and 3, designate the places of the principal artery, nerve, and vein of the leg; 4 gives the subcutaneous vein running within the arm; and 5, the subcutaneous vein of the side of the chest.

In the cut of the inside of the arm, p. 235, the lines above represent, in the order from the front, the principal nerves, arteries, and veins of the shoulder and arm, and, on the muscles, *k* gives the principal subcutaneous vein of the inside of the arm, and *i* the artery by which it is accompanied.

The stifle joint is not often subject to sprain. The heat and tenderness will guide to the seat of injury. Occasionally, dislocation of the patella has occurred, and the horse drags the injured limb after him, or rests it on the fetlock;—the aid of a veterinary surgeon is here requisite. The muscles of the inside of the thigh, generally, have sometimes been sprained: this may be detected by diffused heat, or heat on the inside of the thigh above the stifle;—rest, fomentations, bleeding, and physic, will be the proper means of cure.

THOROUGH-PIN.

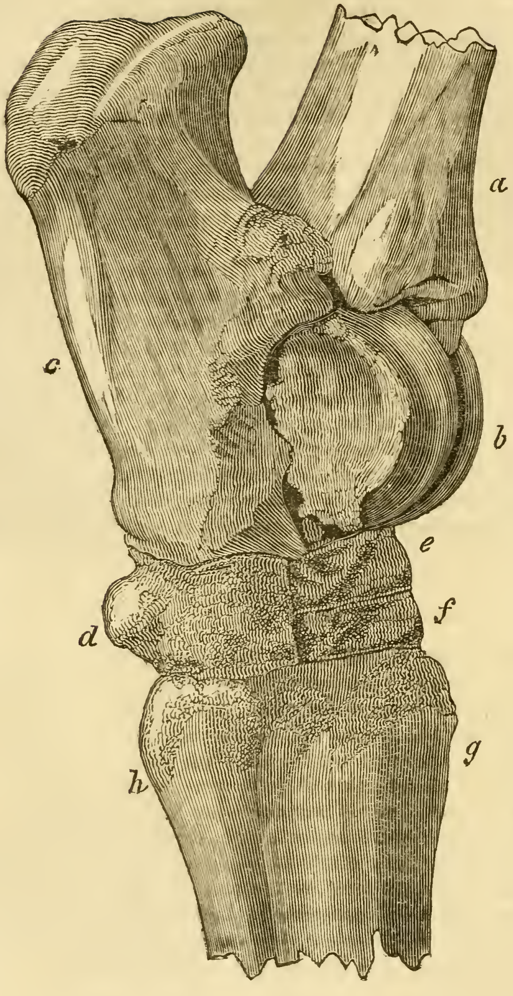
We have observed that there are placed in the neighbourhood of joints, certain bags, containing a mucous fluid for the purpose of lubricating the parts, and that these sometimes become inflamed and enlarge. We have spoken of *wind-galls* and their treatment. A similar enlargement is found above the hock, between the tendons of the flexor of the foot, and the extensor of the hock. As from its situation it must necessarily project on both sides of the hock, in the form of a round swelling, it is called a *thorough-pin*, *a*, p. 262. It is an indication of considerable work, but, except it be of very great size, it is rarely attended by lameness. The mode of treatment must resemble that recommended for wind-galls. Although thorough-pin cannot be pronounced to be unsoundness, yet it behoves the buyer to examine well a horse with thorough-pin, and to ascertain whether undue work may not have injured him in other respects.

THE HOCK.

We now arrive at a very important joint, often the evident, and much oftener the unsuspected seat of lameness, and the proper formation of which is essentially connected with the excellence and value of the horse. We shall describe it a little at length.

The inferior head of the tibia is formed into two deep grooves, with three sharpened ridges, one separating the grooves, and the other two forming the sides of them. It is seen at *a* in the following cut. It rests upon a very singular bone, *b*, called the astragalus (shaped like the die or dice used by the ancients), which has two circular risings or projections, and with a depression between them, answering exactly to the irregularities of the tibia, and these are received and morticed into each other. At the posterior part its convex surface is received into a

CUT OF THE HOCK.



concavity near the base of another bone, and with which it is united by very strong ligaments. This bone *c*, is called the os calcis, or bone of the heel, and it projects upwards, flattened at its sides, and receives, strongly implanted into it, the tendons of powerful muscles. These bones rest on two others, the *os cuboides*, *d*, (cube-formed) behind, and the larger *cuneiform* or wedge-shaped bone *e*, in front. The larger wedge-shaped bone is supported by two smaller ones *f*, and these two smaller ones and the cube-bone by the upper heads of the shank-bone *g*, and the splint-bones *h*. The cube-bone is placed on the external splint-bone, and the cannon bone; the small wedge-bone principally on the inner splint-bone, not seen in the cut; and the middle wedge bone rests on the shank-bone only, *g*. These bones are all connected together by very strong ligaments, which prevent dislocation, but allow a slight degree of motion among them, and the surfaces which are opposed to each other are thickly covered by elastic cartilage.

Considering the situation and action of this joint, the weight and stress thrown upon it must be exceedingly great, and it must be liable to much injury in rapid and powerful motion. What are the provisions to prevent injury? The grooved or pulley-like heads of the tibia, and the astragalus, received deeply into one another, and confined by powerful ligaments, admit freely of hinge-like motion, but of no side motion, to which the joint might be exposed in rapid action, or on an uneven surface. The slightest inspection of the cut will shew that the stress or weight thrown by the tibia *a* on the astragalus *b*, does not descend perpendicularly, but in a slanting direction, by which a great deal of concussion is avoided, or more readily diffused among the different bones; and the joint consisting of six bones, each of them covered with elastic cartilage, and each admitting of a certain degree of motion, this diminished concussion is diffused among them all, and thereby neutralized and rendered harmless. Each of these bones is covered not only by cartilage, but by a membrane secreting the synovia or oily fluid of which we have spoken in other joints; so that these bones are formed into so many distinct joints, separated from each other, and therefore guarded from injury, yet united by various ligaments, possessing altogether sufficient motion, yet bound together so strongly as to defy dislocation. When, however, we consider the work which this joint has to perform, and the thoughtlessness and cruelty with which that work is often exacted, we shall not wonder if this necessarily complicated mechanism is sometimes deranged. The hock is, from its complicated structure and its work, the principal seat of lameness behind. Nine-tenths of the lamenesses that occur in the hind-leg are to be traced to this joint, and when, after careful examination, we are unable to find any other seat of lameness, we shall usually be justified in affirming that the hock is affected.

ENLARGEMENT OF THE HOCK.

First, there is inflammation, or sprain of the hock-joint generally, arising principally from sudden violent concussion; from check at speed; or from over-weight, and attended with enlargement of the whole joint, and great tenderness and lameness. This, however, like other diffused inflammations, is not so untractable as intense inflammations of a more circumscribed nature; and by rest and fomentation, or perchance firing, the limb recovers its action, and the horse becomes fit for ordinary work. The swelling, however, does not always subside. Enlargement, spread over the whole of the hock-joint, remains. A horse with an enlarged hock must always be regarded with suspicion, and is in truth unsound. The parts, altered in structure, are to a certain degree weakened. The horse may discharge his usual work through life, without return of lameness, but if one of those emergencies should occur when all his energies require to be exerted, the disorganised and weakened part will fail. The purchase, therefore, of a horse with enlarged hock will depend on circumstances. If he has other excellencies, he will not be uniformly rejected; for he may be ridden or driven moderately for many a year without inconvenience, yet one extra hard day's work may lame him for ever.

CURB.

There are oftener injuries of particular parts of the hock-joint. We have had occasion frequently to describe the ring-like ligaments, which, in the neighbourhood of joints, so usefully tie down the tendons. From sudden or over exertion these ligaments may be extended, and inflammation, swelling, and lameness may ensue; or the sheaths of the tendons in the neighbourhood of joints, from their extent of motion in these situations, may be susceptible of injury. CURB is an affection of this kind. It is an enlargement at the back of the hock, about three or four inches below the point of the hock. It is represented at *d*, p. 262, and it is either a strain in the ring-like ligament which binds the tendons down in their place, or in the sheath of the tendons; oftener, we are inclined to think, of the ligament than of the sheath. Any sudden action of the limb of more than usual violence may produce it, and therefore horses are found to 'throw out curbs' after a hardly contested race, an extraordinary leap, a severe gallop over heavy ground, or a sudden check in the gallop. Young horses are particularly liable to it, and horses that are *cow-hocked* (vide cut, p. 262), or whose hocks and legs resemble those of the cow, the hocks being turned inward, and the legs forming a considerable angle outwards. This is intelligible enough; for in hocks so formed, the annular ligament must be continually on the stretch to confine the tendon.

Curbs are generally accompanied by considerable lameness at their first appearance, but the swelling is not always great; indeed, it sometimes presents so gradual a curve, that it is scarcely perceivable when we stand behind the horse, and both the horseman and the veterinary surgeon have overlooked it. It is best detected by observing the leg sideway.

The first object in attempting the cure is to abate inflammation, and this will be most readily accomplished by cold evaporating lotions, frequently applied to the part. Equal portions of spirit of wine, water, and vinegar, will afford an excellent application. It will be almost impossible to keep a bandage on. If the heat and lameness are considerable, it will be prudent to physic the horse, and to bleed from the subcutaneous vein, whose course is represented at *r*, page 259. Whether the injury be of the annular ligament, or the sheath of the tendon, more active means will be necessary to perfect the cure. Either a liquid blister should be rubbed on the part, consisting of a vinous or turpentine tincture of cantharides, and this daily applied until some considerable swelling takes place, which should be allowed to subside, and then the liniment again resorted to; or, what is the preferable plan, the hair should be cut off, and the part blistered as soon as the heat has been subdued. The blister should be repeated until the horse goes sound, and the swelling has disappeared. In severe cases it may be necessary to fire, but we cannot recommend the indiscriminate recourse to the hot iron in every case of curb, and we would uniformly give a fair trial to milder measures. If the iron be used, the strokes should be in straight lines.

There are few complaints in which absolute and long-continued rest is more requisite, than in curb. An injury so serious leaves the parts very materially weakened, and, if the horse be soon put to work again, the lameness will frequently return. No horse that has had curbs should be put even to ordinary work in less than a month after the apparent cure, and even then he should very gradually resume his former habits.

A horse with a curb is manifestly unsound. A horse with the vestige of curb we should regard with much suspicion, or generally condemn as unsound; for although the neighbouring parts may have accommodated themselves to the slight enlargement that remains, they are not in their natural situation, and have lost a portion of their natural strength: some latent disposition to relapse may continue, which extraordinary exertion may rouse to action; and, beside this, it should be remembered, that curb is an hereditary complaint, and that there may be some constitutional weakness of these parts.

BOG-SPAVIN.

The hock is plentifully furnished with mucous bags, to lubricate the different portions of this complicated joint. Some of these are found on the inside of the joint, which could not be represented in our cut, page 262. From over-exertion of the joint they become inflamed, and considerably enlarged. They are wind-galls of the hock. The subcutaneous vein passes over the inside of the hock, and over some of these enlarged bags, and is compressed between the skin and the enlarged bag; and, consequently, the passage of the blood through it is partially stopped. The blood, however, continues to be returned from the leg and foot, and being thus arrested in its course, a portion of the vein below the impediment, and between it and the next valve, is distended, and causes the soft tumour on the inside of the hock, called the *bog* or *blood spavin*. This is a very serious disease, attended with no great, but often permanent lameness, and a disease too apt to return, when the enlargement has subsided under medical treatment. It must be considered as decided unsoundness. In a horse for slow draught, it is scarcely worth while even to attack it. In a horse destined to more rapid action, the probability of a relapse should not be forgotten, when the chances of success, and the expenses of treatment are calculated.

The disease (the enlarged mucous capsule) lies deep, and is with difficulty operated upon. Uniform pressure will sometimes cause the absorption of the fluid contained in cysts or bags like these, but in a joint of such extensive motion as the hock, it is difficult, or almost impossible, to confine the pressure on the precise spot where it is required; and could it be made to bear on the enlarged bag, it would likewise press on the vein, and to a greater degree hinder the passage of the blood, and increase the dilatation below the obstruction. The old and absurd method of passing a ligature above and below the enlarged portion of the vein, and then dissecting out the tumour, is not, in the advanced stage of veterinary science, practised by any surgeon who has a regard to his reputation. The only method of relief which holds out any promise even of temporary success, is by exciting a great deal of inflammation on the skin, and thus rousing the deeper seated absorbents to carry away the fluid effused in the enlarged bag. Repeated blisters then will afford the fairest prospect of removing the tumour, or firing may be tried; but in the majority of cases, the disease will bid defiance to all our means, or will return, and baffle our hopes when we had seemed to have been accomplishing our object. A horse with bog-spavin will do very well for ordinary work. He may draw in a cart, or trot fairly in a lighter carriage, with little detriment to his utility, but he will never do for rapid or hard work, and it is in vain to attempt to make him.

BONE-SPAVIN.

A still more formidable disease ranks under the name of spavin, and is an affection of the bones of the hock-joint. We have observed that the bones of the leg, the shank-bone *g*, page 266, and the two little splint-bones behind, *h*, support the lower layer of the bones of the hock. The cube bone, *d*, rests principally on the shank-bone, and in a slight degree on the outer splint-bone. The middle wedge bone, *f*, rests entirely upon the shank-bone, and the smaller wedge (not seen in the cut) rests in a very slight degree on the shank-bone, but principally or almost entirely on the inner splint-bone. Then the splint-bones sustain a very unequal degree of concussion and weight. Not only is the inner one placed more under the body, and nearer the centre of gravity, but it has almost the whole of the weight and concussion communicated to the little wedge-bone carried on to it. It is not, therefore, to be wondered at, that in the violent action of this joint in galloping, leaping, heavy draught, and especially in young horses, and before the limbs have become properly knit, the inner splint-bone, or its ligaments, or the substance which connects it with the shank-bone, should suffer material injury. The smith increases the tendency to this, by his injudicious management of the feet. It is a common notion, that cutting, and wounds in the feet, from one foot treading on the other, are prevented by putting on a shoe with a *calkin* on the outer heel, that is, the extremity of the heel of the shoe being bent, and thus the outer heel considerably raised from the ground. It is not unusual to see whole teams of horses, and that all the year round, with the outer heel of the hind foot considerably raised above the other. This unequal bearing, or distribution of the weight, cannot fail of being injurious; it will place an unequal strain on the ligaments of the joints, and particularly of the hock-joint, and increase the tendency to spavin.

The weight and concussion which are thus thrown on the inner splint-bone produce, in the first place, inflammation of the cartilaginous substance which unites it to the shank-bone. The consequence of this is, that the cartilage is absorbed, and bone deposited;—the union between the splint-bone and the shank becomes bony instead of cartilaginous;—the degree of elastic action between them is destroyed, and there is formed a splint of the hind-leg. This is uniformly on the inside of the hind-leg, because the greater weight and concussion are thrown on the inner splint-bones. As in the fore-leg, the disposition to form bony matter having commenced, and the cause which produced it continuing to act, bone continues to be deposited, and it appears generally in the form of a tumour, where the head of the splint-bone is united with the shank, and in front of that union. It is seen at *c*, page 262. This is called BONE-SPAVIN. Inflammation of the ligaments of any of the small bones of the hock, proceeding to bony tumour, would equally class under the name of spavin, but, with very few exceptions, the disease commences on the precise spot we have described.

When spavin is forming there is always lameness, and that frequently to a very great degree; but when the membrane of the bone has accommodated itself to the tumour that extended it, the lameness subsides, or disappears, or depends upon the degree in which the bony deposit interferes with the motion of the joint. We often see horses with exceedingly large spavins, that are only slightly lame, or that merely have a stiffness in their gait at first starting, and that gradually goes off after a little motion; and we meet with others with the bony tumour comparatively small, yet the lameness so great as to destroy the usefulness of the horse. There is always this peculiarity in the lameness of spavin, that it abates, and sometimes disappears, on exercise; and therefore, a horse, with regard to which there is any suspicion of spavin, should be examined, when it first in the morning is taken from the stable.

If the spavin continues to increase, the bony deposit first spreads over the lower wedge bones, *f*, page 266, for these are nearest to its original seat. They are capable of slight motion, and share in every action of the joint, but their principal design was to obviate concussion. The chief motion of the joint, and that compared with which the motion of the others is scarcely to be regarded, is confined to the tibia *a*, and the astragalus *b*, and therefore, stiffness rather than lameness may accompany spavin, even when it is beginning to affect the small bones of the joint. Hence, too, we see the advantage of these bones having each its separate ligaments and membranes, and constituting so many joints, since injury may happen to some of them, without the effect being propagated to the rest. When the bony deposit continues to enlarge, and takes in the second layer of bones, the larger wedge bones *e*, and even spreads to the cube bones on the other side, even then the lameness may not be excessive, because these two are joints, or parts of the joint, in which the motion is small; but when it extends to the union of the tibia *a*, and the astragalus *b*; when the joint, in which is the chief motion of the hock, is attacked, the lameness is indeed formidable, and the horse becomes nearly or quite useless. A recollection of the situation of the different bones of the hock may, in some measure, guide the purchaser as to the probable value and use of the spavined horse; but he must not depend on this, for deep-seated deposits of bone, which the eye cannot reach, may interfere more with the action of the joint, than any outward enlargement, however great.

Spavined horses are generally capable of slow work. They are equal to the greater part of the work of the farm, and therefore they will not be always rejected by the small farmer, and may generally be procured at little price. These horses are not only capable of agricultural work, but they generally improve under it; they become less lame, and even the bony tumour to a certain degree diminishes. There is sufficient moderate motion and friction of the limb to rouse the absorbents to action, and cause them to take up a portion of the bony matter thrown out, but not enough to renew or prolong inflammation. We cannot say that the plough affords a *cure* for spavin, but we have seen many instances in which the spavined horse has very materially improved at it.

For fast work, and for work that must be regularly performed, they are not so well calculated; for this lameness behind produces great difficulty in rising up, and the consciousness that he will not be able to rise without painful effort, prevents the horse from lying down at all; and a horse that cannot rest well, cannot long travel far and fast. This is well known to postmasters. A foundered horse may do his work, for as soon as he has satisfied his appetite he is down; but the horse that will seldom or never lie down, must be speedily worn out.

Our cut shews at *e*, the natural situation of spavin, but there is sometimes an expansion of the heads of the bones of the leg, that looks very much like it, and has been mistaken for it. Both hocks should be examined, for it is rare that there will be an unnatural growth of bone of precisely the same form and appearance in both; and if there be a natural projection, or breadth of the heads of the bones, all the other joints will present the same bold character.

The treatment of spavin is simple enough, but not always effectual. The owner of the horse will neither consult his own interest, nor the dictates of humanity, if he suffers the chisel and mallet, or the gimblet, or the pointed iron, or arsenic to be used; yet measures of considerable severity must be resorted to. Repeated blisters will usually cause either the absorption of the bony deposit, or the abatement or removal of the inflammation of the ligaments. As a last resort, however, the hot iron may be applied.

We have thus presented our readers with a fearful list of diseases belonging to the hock, but our catalogue is not completed. It is well known that the horse is frequently subject to lameness behind, when no ostensible cause for it can be found, and there is no external heat or enlargement to indicate its seat. Farriers and grooms pronounce these to be affections of the stifle, or round-bone; or if the gait of the horse and peculiar stiffness of motion point out the hock as the affected part, yet the joint may be of its natural size, and neither heat nor tenderness can be discovered. The groom has here a method of unravelling the mystery: he says that it is the beginning of spavin; but months and years pass away, and the spavin does not appear, and the horse is at length destroyed as incurably lame. Horsemen are indebted to Mr. W. J. Goodwin for the discovery of the seat of frequent lameness behind. Our cut represents two layers of small bones on the inside of the hock; the larger wedge-like bone *e* above; and the middle *f*, and the smaller one below, and it will be seen that almost the whole of the weight of the horse, communicated by the tibia *a*, is thrown upon these bones. The cube-bone *d* does little more than support the point of the hock *c*. It is then easy to suppose, that in the concussion of hard work or rapid travelling, these bones, or the delicate and sensible membranes in which they are wrapped, may be severely injured. Repeated dissections of horses that have been incurably lame behind, without any thing external to point out the place or cause of lameness, have shewn that inflammation of the membranes lining these joints, and secreting the fluid that lubricates them, has taken place; and has been accompanied by all the pain of joint disease, and evils corresponding to those which we have described, when treating of broken knees, and the consequent inflammation of the membrane and internal part of the joint. Indeed, so clearly is this now established, that when, after careful and repeated examination by a competent person, no seat or cause of lameness can be discovered, we shall be right nineteen times out of twenty, in deciding that it is disease in this portion of the hock. No enlargement, no heat, will indicate its existence, but when it has been long established, and ossified matter has been thrown out between these bones, it will, like the true spavin, spread, and appear either on the inside of the hock, or surrounding the whole of the joint.

In these cases, then, of mysterious lameness, and when, after the removal of the shoe, and the most patient search, we have failed in discovering a cause of lameness elsewhere, we shall be justified in considering this as the affected part, and treating it accordingly: and as the injury is deep, and in the very centre of the joint, we must adopt severe measures in order to reach it. We must blister immediately, and repeat the blister, and enjoin perfect quietude and rest; but here, as in the bone-spavin, and oftener than in that disease, all our appliances and means may be fruitless. Our only hope lies in an early attempt to combat the evil; and in all these obscure cases, he is unjust to himself who does not speedily have recourse to their advice, to whom science and practice have given a facility in detecting latent disease.

THE POINT OF THE HOCK.

If the reader has not forgotten what we have said concerning the projection of the elbow, he will be convinced that the form of the hock is materially connected with the value of the horse. The most powerful of the flexor or bending muscles are inserted into the point of the hock, or the extremity of the os calcis *c*; and in proportion to the projection of the hock, or, in other words, the length of this bone, will two purposes be effected. The line of direction will be more advantageous, for it will be nearer to a perpendicular; and the arm of the lever to which the power is applied will be lengthened, and mechanical advantage will be gained to an almost incredible extent. Suppose this bone of the hock to be three inches in length; the joint formed by the tibia and the astragalus is evidently the centre of motion; and the weight, concentered about the middle of the shank, is the obstacle to be overcome. If the weight be four times as far from the centre of motion as the power, a force equal to four times the weight would raise it. It is, however, here to be remembered, that it is not merely the weight of the leg which is to be raised, but the weight of the horse, for the time resting upon the leg, and that weight to be propelled or driven forward. At what shall we calculate this? We may fairly suppose that the muscles whose tendons are inserted into the point of the hock exert an energy equal to 4000lbs. Let us further suppose, that an inch is added to the point of the hock, which will be an addition of one-third to its length: a muscular power of less than 3000lbs. will now effect the same purpose. The slightest lengthening, therefore, of the point of the hock will make an exceedingly great difference in the muscular energy by which the joint is moved; and a difference that will wonderfully tell in a long day's work. On this account, the depth of the hock, or the length of the bone of which we are speaking, is a point of the greatest importance.

There is, however, a limit to this. In proportion to the length of this bone must be the space which it passes over in order sufficiently to bend the limb; and in that proportion must be the contraction of the muscle; and consequently the length of the muscle, that it may be enabled thus to contract; and, therefore, if this bone were inordinately lengthened, there would require a depth of quarter which would amount to deformity. A hock of this disadvantageous length is, however, rarely or never met with, and it is received among the golden rules in judging of the horse, that this bone of the hock cannot be too long.

CAPPED HOCK.

The point of the hock is sometimes swelled. A soft fluctuating tumour appears on it. This is an enlargement of one of those mucous bags of which we have spoken, and which surrounds the insertion of the tendons into the point of the hock. It is seldom accompanied by lameness, but yet it is a serious business. It is usually produced by blows, and, in the majority of instances, by the injury which the horse inflicts upon himself by kicking: therefore a horse with a capped hock is properly regarded with a very suspicious eye. The whole of the hock should be most carefully examined, in order to discover whether there are other marks of violence, and the previous history of the animal should, if possible, be obtained. Generally the kicking is in harness, but some horses have the habit of kicking in the stall: it is possible, however, that lying on a thin bed, or on no bed, may bruise the hock and produce the swelling, or it may even result from sprain of the hock; but we repeat that it is far oftener the consequence of external violence.

Here again it is exceedingly difficult to apply a bandage; and puncturing the tumour, or passing a seton through it, would be a most injudicious and dangerous practice. Blisters, repeated as long as may be necessary, are the proper means to be employed. Sometimes the tumour will disappear of itself, but at others it will attain a very large size, or will assume a callous structure that will bid defiance to all the means we can employ.

MALLENDERS AND SALLENDERS.

In the inside of the hock, or a little below it, as well as at the bend of the knee, (see *h*, page 254,) there is sometimes a scurfy eruption called MALLENDERS in the fore leg, and SALLENDERS in the hind leg. They seldom produce lameness, but if no means are taken to get rid of them, a discharge proceeds from them which it is afterwards difficult to stop; and certainly they have an unsightly appearance, and generally argue bad stable management. A diuretic ball should be occasionally given, and an ointment, composed of one part of sugar of lead, two of tar, and six of lard, rubbed over the part. Should this fail, the weak mercurial ointment should be used.

COW-HOCKS.

The line of direction of the legs beneath the hocks should not be disregarded. The leg should descend perpendicularly to the fetlock. The weight and stress will thus be equally diffused, not only over the whole of the hock, but also the pasterns and the foot. Some horses, however, have their hocks closer than natural to each other, and the legs take a divergent direction outward, and the toes likewise are turned outward. These horses are said to be cat or cow-hocked. They are generally supposed to possess considerable speed, and we believe that they do; and we thus account for it. The cow-hocked horse has his legs not only turned more outward, but bent more under him, and this increases the distance between the point of the hock and the tendons of the perforating muscle: see *b*, cut page 262. It increases the space which is usually occupied by thoroughpin, *a*, in the same page. Then the point of the hock, moved by the action of the muscles, is enabled to describe a greater portion of a circle; and in proportion to the increased space passed over by the point of the hock, will the space passed over by the limb beneath be increased, and so the stride of the horse may be lengthened, and thus far his speed may be increased. But this advantage is more than counterbalanced by many evils. This increased contraction of the muscles is an expenditure of animal power, and, as we have already stated, the weight and the concussion being so unequally distributed by this formation of the limbs, some part must be overstrained and overworked, and injury must ensue. On this account it is, that the cow-hocked horse is more subject than others to thoroughpin and spavin; and is so disposed to curbs, that these hocks are denominated by horsemen *curby* hocks. The mischief extends even farther than this. Such a horse is peculiarly liable to windgall, sprain of the fetlock, cutting, and knuckling.

A slight inclination to this form in a strong powerful horse may not be very objectionable, but a horse decidedly cow-hocked should never be selected.

STRING-HALT

Before we quit the hock, we must notice a peculiar involuntary twitching of the hind leg, or convulsive action of the muscles by which it is bent, and which is termed STRING-HALT. This is evidently an affection of some of the nerves which communicate motion to these muscles. It is an irregular action of nervous energy; but what particular fibril is affected, or what muscle is chiefly spasmed, has never been ascertained. It is principally observed when the horse first comes from the stable, and gradually ceases after he has been exercised a while. It is unpleasant to the rider, but it cannot be denominated unsoundness; on the contrary, common opinion has given to the horse with string-halt a more than usual share of strength and endurance; and if it be an excess of nervous energy, although irregularly exerted, we shall find no difficulty in associating it with general powerful muscular action. However this may be, the precise nature of the defect has never been determined, nor has any cure for it been discovered.

THE HIND LEG.

The construction of the hind leg, and the injuries to which it is subject, are so similar to those of the fore leg, that we shall content ourselves with referring to our description of them given at page 243, only observing that the shank bone is longer than that of the fore leg; the outer splint bone is considerably larger than the inner one, and the pasterns are longer than those of the fore leg, and less oblique.

On the back part of the leg (*f*, page 262) are sometimes excrescences, called by farriers RAT-TAILS, from the appearance they give the hair. They will generally yield to the mild mercurial ointment, but in very bad cases it may be necessary to remove them with a knife.

Before we quit the legs, we must notice two frequent and very troublesome diseases. The first is

SWELLED LEGS

The fore legs are sometimes subject to considerable enlargement, but much oftener the hind ones. Occasionally when the horse does not seem to labour under any other disease, and sometimes from an apparent shifting of inflammation from other parts, (inflammation of the lungs or the eye not unfrequently thus changes its seat,) the hind legs suddenly swell to an enormous degree from the hock, and almost from the stifle to the fetlock, attended by heat, and extreme tenderness of the skin, and excessive and very peculiar lameness. The pulse likewise becomes quick and hard, and the horse evidently labours under considerable fever. It is acute inflammation of the cellular substance of the legs, and that most sudden in its attack, most violent in its degree, and therefore attended by the pouring out of a great deal of fluid, in this cellular substance. It occurs in young horses, and in those which are over-fed and little exercised, without previous inflammation in any other part. Fomentation, diuretics, or physic, or, if there be much fever, a moderate bleeding, will often relieve the distention almost as suddenly as it appeared.

The kind of swelled legs, most frequent of occurrence, and most troublesome, is of a different nature, or rather it is so various in its kind and causes, and consequences and mode of treatment, that it deserves attentive consideration. One principle, however, will guide us to a right opinion and treatment of it,—that it is produced either by *actual or comparative debility or loss of power in the part attacked.* Horses seemingly in perfect health, and with a full allowance of food, if suffered to remain several days without exercise, will have swelled legs. The arterial capillary vessels have conveyed a great deal of fluid to the extremities;—from over-feeding and want of muscular exertion and the perspiration connected with it, the fluids have accumulated, and are lodging in the extremities, because the vessels have not power to return them. The heart is acting upon an additional quantity of fluid, while, by the want of exercise, the limbs are deprived of the principal power by which the fluids are returned; for the blood is materially assisted in its return through the veins by the action of the muscles, and the absorbents are roused to action by the exercise and motion of the different parts. The cure, therefore, is sufficiently plain: by physic or diuretics, the quantity of the fluid is lessened, and by exertion increasing the perspiration it is likewise diminished, and, what is more important, both the veins and the absorbents are assisted in their action.

Horses taken from grass and brought into close stables very speedily have swelled legs, because the difference of food, and increase of nutriment, rapidly increase the quantity of the circulating fluid; while the want of exercise takes away the means by which it might be got rid of. The remedy here needs not to be stated. Swelled legs, however, may proceed from general debility; they may be the consequence of starvation, or disease that has considerably weakened the animal; and these parts, being farthest from the centre of circulation, are the first to shew the loss of power by the accumulation of fluid in them. Here the means of cure would be to increase the general strength, with which the extremities would sympathise, and mild diuretics and tonics are evidently indicated.

Horses in the spring and fall are subject to swelled legs. The powers of the constitution are principally employed in providing a new coat for the animal, and the extremities have not their share of vital influence. Mingled cordials and diuretics are indicated here—the diuretic to lessen the quantity of the circulating flood,—the cordial to invigorate the frame.

Swelled legs are most teasing in horses that are in tolerable or good health, but whose work is somewhat irregular. The pleasure-horse and the hunter are the frequent subjects of this complaint. The cure is to give more equable exercise;—to walk the horse out daily when the usual work is not required, and by some mechanical means to supply to the extremities the want of the motion of the parts, and the consequent urging on of the return of the fluid. Friction by hand-rubbing is an excellent means of fining the legs, at least for a time. Bandages have a greater and more durable effect, for nothing tends more to support the capillary veins, and rouse the action of the absorbents, than moderate pressure. Hay-bands will form a very good bandage for the agricultural horse, and their effect will probably be increased by previously dipping them in water. As to medicines we have little to say: the fewer of them that are given in these cases the better. The diuretic, or urine-ball, the constant resource of the idle groom or carter, is particularly objectionable. Its frequent and undue stimulus of the urinary organs will be followed by speedy, and often incurable debility. If the swelling bids defiance to exercise and friction and bandage, the aid of the diuretic may be resorted to, but never until these have failed, unless there be an evident tendency to grease or humour.

GREASE.

Swelled legs, although distinct from GREASE, are apt to degenerate into it. This disease, therefore, comes next under our consideration. It is an inflammation of the skin of the heel, sometimes of the fore, but oftener of the hind foot. It is not a contagious disease, although when it once appears in a stable it frequently goes through it, for it is usually to be traced to bad stable management. The skin of the heel of the horse somewhat differs from that of any other part. There is a great deal of motion in the fetlock, and to prevent the skin from excoriation or chapping, it is necessary that it should be kept soft and pliable; therefore, in the healthy state of the part, the skin of the heel has a peculiar greasy feel. Under inflammation, the secretion of this greasy matter is stopped—the heels become red, dry, and scurfy; and being almost constantly in motion, cracks soon succeed: these sometimes extend, and the whole surface of the heel becomes a mass of soreness, ulceration, and fungus.

The heel is subject to this virulent inflammation, on account of its situation, far removed from the centre of the circulation. It is likewise exposed to more variations of temperature than any other part of the frame. As the horse stands in the closed stable, the heat of the part is increased by being deeply imbedded in straw. When the stable door is open, the heels are nearest to the door, and most powerfully receive the current of cold air; and when the horse is taken from the stable to his work, the heels are covered with mire and wet, and chilled by the slow and long process of evaporation, which is taking place from them. We cannot wonder then at the frequency with which the heels are attacked with inflammation, nor the difficulty there is in subduing that inflammation. In the winter season, chaps and cracks will occasionally appear in the best conducted stables; but where the comfort of the animal is neglected, and every kind of filth is suffered to accumulate, the disease will be more frequent and more virulent.

The farmer's horse is not so subject to grease as many others, because he is not usually exposed so much to sudden and extreme changes of temperature, and the heels particularly are not thus exposed. In many instances he lives almost entirely out of doors, or, if he is stabled, the stables of the little farmer are not always air-tight. The wind finds its way through many a cranny, instead of entering at the door alone, and blowing upon the heels.

A great deal of error has prevailed, and it has led to much bad practice, in connecting grease with the notion of humours flying about the horse, which must have vent somewhere, and which attack the heels as the weaker parts of the frame. Thence arise the physicking, and the long course of diuretics, which *truly* weaken the animal, and often do irreparable mischief. Grease is a local complaint;—it is produced principally by causes which act locally; and it is most successfully treated by local applications. Physic and diuretics may be useful in abating inflammation; but the grand object is to abate the inflammatory action which exists in the skin of the heel, and to heal the wounds, and remedy the mischief which it has occasioned.

The first appearance of grease is usually a dry and scurfy state of the skin of the heel, with redness, heat, and itchiness. The heel should be well washed with soap and water; as much of the scurf should be detached as is easily removable: white ointment composed of one drachm of sugar of lead, rubbed down with an ounce of lard, will usually supple and cool, and heal the part.

When cracks appear, the mode of treatment will depend on their extent and depth. If they are but slight, a lotion composed of a solution of two drachms of blue vitriol, or four of alum, in a pint of water, will often speedily dry them up and close them. But if the cracks are deep, with an ichorous discharge, and the lameness considerable, it will be necessary to poultice the heel. A poultice of linseed meal will be the most effectual, unless the discharge is thin and offensive, when an ounce of finely powdered charcoal should be mixed with the linseed meal, or a poultice may be made of carrots boiled soft, and mashed. The efficacy of a carrot poultice is seldom sufficiently appreciated in cases like these.

When the inflammation and pain have evidently subsided, and the cracks discharge good matter, they may be dressed with an ointment composed of one part of resin, and three of lard, melted together, and one part of calamine powder added, when these begin to get cool. The healing will be quickened if the cracks are occasionally washed with either the vitriol, or alum solution. A mild diuretic may here be given every third day, but a mild dose of physic will form the best medicine that can be administered.

After the chaps or cracks have healed, the legs will sometimes continue gorged and swelled. A flannel bandage evenly applied over the whole of the swelled part will be very serviceable; or, should the season admit of it, a run at grass, particularly spring grass, should be allowed. A blister is inadmissible, from the danger of bringing back the inflammation of the skin, and discharge from it; but the actual cautery, taking especial care not to penetrate the skin, must occasionally be resorted to.

In some cases the cracks are not confined to the centre of the heels, but spread over them, and extend on the fetlock, and even up the leg, while the legs are exceedingly swelled, and there is a watery discharge from the cracks, and apparently oozing through the skin at other places. The parts are exceedingly tender, and sometimes hot, and there is an appearance which the farrier thinks very decisive as to the state of the disease, and which the better informed man should not overlook,—*the heels smoke*;—the skin is so hot, that the watery fluid partly evaporates as it runs from the cracks, or oozes through the skin.

There will be great danger in suddenly stopping this discharge. Inflammation of a more important part has rapidly succeeded to the injudicious attempt. The local application should be directed to the abatement of the inflammation. The poultices just referred to should be diligently used night and day, and especially the carrot poultice; and, when the heat and tenderness and stiffness of motion have diminished, astringent lotions may be applied; either the alum lotion, or a strong decoction of oak bark, changed, or used alternately, but not mixed. The cracks should likewise be dressed with the ointment above-mentioned; and the moment the horse can bear it, a flannel bandage should be put on, reaching from the coronet, to three or four inches above the swelling.

The medicine should be confined to mild diuretics, mixed with one-third part of cordial mass, or, if the horse be gross, and the inflammation run high, a dose of physic may be given. From the account we have given, it will easily be distinguished in what cases physic is indicated, and in what states of the constitution or disease we may be content with diuretics. If the horse be strong, and full of flesh and fat, physic should always precede, and sometimes supersede the diuretics; in cases of much debility, diuretics with aromatics or tonics will be preferable.

The feeding will likewise vary with the case, but with these rules, which admit of no exception, that green meat should be given, and more especially carrots, when they are not too expensive, and mashes, if the horse will eat them, and never the full allowance of corn.

Walking exercise should be resorted to as soon as the horse is able to bear it, and this by degrees may be increased to a gentle trot.

From bad stable management at first, and neglect during the disease, a yet worse kind of grease is occasionally found. The ulceration extends over the skin of the heel and the fetlock, and a fungus springs from the surface of both, highly sensible, bleeding at the slightest touch, and interspersed with scabs. By degrees, portions of the fungus begin to be covered with a horny substance, protruding in the form of knobs, and collected together in bunches. These are known by the name of *grapes*. A stinking and very peculiar discharge proceeds from nearly the whole of the unnatural substance. The horse evidently suffers much and is gradually worn down by the disease. The assistance of a veterinary surgeon is here indispensable.

Some horses are more subject to grease than others, particularly draught horses, both heavy and light, but particularly the former, and if they have no degree of blood in them. It was the experience of this which partly contributed to the gradual change of coach and other draught horses to those of a lighter breed. It may, however, be affirmed, without danger of error, that, in the great majority of cases, grease arises from mismanagement and neglect; and the farmer and the horse-proprietor would not be unjust to their servants, and would materially promote their own interest, if they exacted a fine for every case of grease that occurred in their stable.

Every thing that has a tendency to excite inflammation in the skin of the heel is a cause of grease. Therefore, want of exercise, for the reasons which we have stated when treating of swelled legs, is a frequent cause; the fluid which accumulates about the extremities, and is unable to return, is a source of irritation by its continued pressure. When high feeding is added to irregular or deficient exercise, this disease is evidently still more likely to be produced. Want of cleanliness in the stable is a fruitful source of this complaint. When the heels are embedded in filth they are weakened by the constant moisture surrounding them, and irritated by the acrimony of the dung and the urine, and little prepared to endure the evaporation and cold to which they are exposed when the horse is taken out of the stable. We believe, however, that the absurd practice of washing the feet and legs of horses when they come from their work, and either carelessly sponging them down afterwards, or leaving them to dry as they may, is by far the most common origin of grease.

When the horse is warmed by his work, and the heels share in the warmth, the momentary cold of washing may not be injurious if the animal be immediately rubbed dry; yet even this would be better avoided: but to wash out the heels, and then leave them partially dry, or perfectly wet, and suffering from the extreme cold which is produced by evaporation from a wetted surface, is the most absurd, dangerous, and injurious practice that can be imagined. It is worse when the post-horse or the plough-horse is plunged up to his belly in the river or pond, immediately after his work. The owner is little aware how many cases of inflammation of the lungs, and bowels, and feet, and heels, follow. It would, therefore, be an excellent rule never to wash the heels of these horses. After they have been suffered to stand for twenty minutes in the stable, during which time the horse-keeper or the carter may be employed in taking care of the harness, or carriage, or beginning to dress the horse, the greater part of the dirt which had collected about the heels may be got rid of with a dry brush; and the rest will disappear a quarter of an hour afterwards under the operation of a second brushing. The trouble will not be greater, and the heels will not be chilled and subject to inflammation.

There has been some dispute as to the propriety of cutting the hair from the heels. Custom has very properly retained the hair on our farm-horses. Nature would not have given it had it not been useful. It guards the heel from being injured by the inequalities of the ploughed field; it prevents the dirt in which the heels are constantly enveloped, from reaching and caking on and irritating the skin; it hinders the usual moisture which is mixed with the clay and mould from reaching the skin, and it preserves an equal temperature in the parts. If, however, the hair be suffered to remain on the heels of our farm-horses, there is greater necessity for brushing and hand-rubbing the heels, and never washing them; for the water used in washing will readily penetrate through the hair, and it will be absolutely impossible to get rid of it again. Indeed, we would neglect the heels altogether, or let, as many careless carters do, the dirt accumulate from month to month, rather than wash them. This would, indeed, be idle and injurious treatment, but it would be by far the lesser evil.

Fashion and utility have removed the hair from the heels of our hackneys and carriage-horses. In the usual state of our roads this defence is not wanted, or, rather, the hair would be a perfect nuisance. The hand-rubbing or dry brushing will be an easy process; or if the heels must be washed, let them be carefully and thoroughly dried. We close this part of our treatise by repeating that grease is the child of negligence and mismanagement. It is driven from our cavalry, and it will be the fault of the gentleman and the farmer if it be not speedily banished from every stable.

Chapter XV.

THE FOOT.

The foot is composed of the horny box which covers the extremities of the horse, and the contents of that box. We will first consider the hoof, or box, which is composed of the crust or wall, the bars, the sole, and the horny frog.

THE CRUST OR WALL OF THE HOOF.

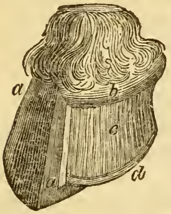
The crust, or wall, is that portion which is seen when the foot is placed on the ground, and reaches from the termination of the hair to the ground. It is deepest in front, where it is called the toe (see cut, p. 255); shallower at the sides, which are denominated the quarters; and of least extent behind, where it is termed the heel. It is placed flat on the ground, but ascends obliquely backward, and possesses different degrees of obliquity in different feet. In a sound hoof, the proper degree of slanting is calculated at forty-five degrees, or the fourth part of a semicircle. When it is more oblique, or the crust is said to have "fallen in," it indicates undue flatness of the sole, or, if the obliquity be very much increased, pumiced, or convex sole. If it be more upright than the angle we have mentioned, it shews a contracted foot, and a sole too concave; so that there is no necessity to take up the foot in order to ascertain either of these states of it. It is also of importance to observe whether the depth of the crust appears rapidly or slowly to decrease from the front to the heel. If the decrease be little, and even at the heel the crust is high and deep, it indicates a foot liable to contraction, and sand-crack, and thrush and inflammation, and the pastern is upright, and the paces of the horse are not pleasant. If the crust diminish rapidly in depth, and the heels are low, this is accompanied by too great slanting of the pastern, and disposition to sprain of the back sinew; the foot itself is liable to be weak and flat and bruised, and there is likewise more tendency to that frequent but obscure lameness of which we shall have occasion to treat, termed the "navicular-joint disease." The foot has spread out too much at the side, instead of growing upward, and therefore it is too much exposed.

The crust in front is rather more than half an inch in thickness, and becomes gradually thinner towards the quarters and heels. If, therefore, there be but half an inch for nail-hold at the toe, and not so much at the quarters, we need not wonder if horses are occasionally wounded in shoeing, and especially when some of them are so unmanageable while undergoing that process.

While the crust gets thinner towards both quarters, it is thinner at the inner quarter than it is at the outer, because more weight is thrown upon it than upon the outer. · It is more under the horse; it is under the inner splint-bone, on which so much more of the weight rests than on the outer, and, being thinner, it is able to expand more; its elasticity is called more into play, and concussion and injury are avoided. When the expansion of the quarters is prevented by their being nailed to an unbending shoe, the inner quarter suffers most. Corns are oftenest found there; contraction begins there; sand-crack is seated there. Nature meant that this should be the most yielding part, in order to obviate concussion, because on it the weight was principally thrown, and therefore when its power of yielding is taken away it must be the first to suffer.

A careful observer will likewise perceive that the inner quarter is a little higher than the outer. While it is thin to yield to the shock, its increased surface gives it sufficient strength.

On account of its thinness, and the additional weight which it bears, the inner heel wears away quicker than the outer; a circumstance that should never be forgotten by the smith. His object is to give a plain and level bearing to the whole of the crust. To accomplish this, it will be often scarcely necessary to remove anything from the inner heel, for it is already removed by the wear of the foot. If he forgets this, as he too often seems to do, and takes off with his knife or his buttress an equal portion all round, he leaves the inner and weaker quarter lower than the outer; he throws an uneven bearing upon it; and produces corns and sand-cracks and splints, which a little care and common sense might have avoided. The crust does not vary much in thickness, (see *a*, page 249, and *b* in the accompanying cut,) until near the top, at the *coronet*, or union of the horn of the foot with the skin of the pasterns where (*w*, page 249) it rapidly gets thin. It is in a manner scooped and hollowed out. It likewise changes its colour and its consistence, and seems almost like a continuation of the skin, but easily separable from it by maceration, or disease. This thin part is called the *coronary ring*, *x*, p. 249; and it receives within it, or covers, a thickened and bulbous prolongation of the skin, called the *coronary ligament*, (see *b* in the accompanying cut.) This requires a better name, for it has not a portion of ligamentous structure in it. This prolongation of the skin is thickly supplied with blood-vessels. It is almost a mesh of blood-vessels connected together by fibrous texture, and many of these vessels are employed in secreting or forming the crust or wall of the foot. Nature has enabled the sensible laminæ of the coffin bone *c*, which will be described presently, to secrete some horn, in order to afford an immediate defence for itself when the crust is wounded or taken away. Of this we have proof, when in sand-crack, or quittor, we are compelled to remove a portion of the crust. A pellicle of horn, or of firm hard substance resembling it, soon covers the wound; but the crust is principally formed from this coronary ligament. Hence it is, that in sand-crack, quittor, and other diseases in which strips of the crust are destroyed, it is so long in being renewed, or *growing down*. It must proceed from the coronary ligament, and so gradually creep down the foot with the natural growth or lengthening of the horn, of which, as in the human nail, a supply is slowly given to answer to the wear and tear of the part.

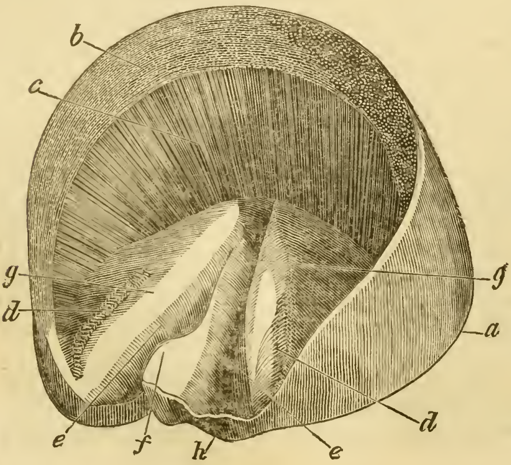


Below the coronary ligament is a thin strip of horny matter, which has been traced from the frog, and has been supposed by some to be connected with the support or action of the frog, but which is evidently intended to add to the security of the part on which it is found, and to bind together those various substances which are collected at the coronet. It resembles, more than anything else, the strip of skin which surrounds the root of the human nail, and which is placed there to strengthen the union of the nail with the substance from which it proceeds.

The crust is composed of numerous fibres running at the toe in a straight direction from the coronet to the ground, but at the quarters, taking an oblique direction from the heel forwards. This construction is best calculated to enable the foot to expand when it comes in contact with the ground, and by that expansion, permitting the gradual descent of the bones of the foot, and obviating much concussion. The crust is thinner at the quarters and towards the heels, because those are the parts at which the principal expansion must take place. These fibres are held together by a glutinous substance, but in such a manner as to permit a slight degree of separation, or to bestow the power of expansion on the foot; and when recently separated from the foot, it is an exceedingly elastic substance, and very tough, that it may not chip and break with the violence to which it is often exposed.

In the absurd method of stable management, to which we shall have occasion again and again to refer, it sometimes loses much of this toughness, and becomes brittle and liable to chip and break. Inflammation of the internal part of the foot, by the increased heat which is produced, will cause brittleness of the hoof; deficiency of moisture and neglect of stopping will produce the same effect. Many horses are peculiarly liable to brittle hoofs during the summer; this is a very serious defect, and in some cases so much of the hoof is gradually broken away, that there is no hold left for the nails. A mixture of one part of oil of tar, and two of common fish oil, well rubbed into the crust and the hoof, will restore the natural pliancy and toughness of the horn, and very much contribute to the quickness of its growth.

The wall of the hoof should be smooth and level: protuberances or rings round the crust indicate that the horse has had fever in the feet; and that to such a degree as to produce an unequal growth of horn, and probably to leave some injurious consequences in the internal part of the foot. If there be a depression or hollow in the front of the foot, it betrays a sinking of the coffin-bone, and a flat or pumiced sole; if the hollow be at the quarters, it is the worst system of bad contraction.



a The external crust seen at the quarter.

b The coronary ring.

c The little horny plates lining the crust.

d The same continued over the bars.

e e The two concave surfaces of the inside of the horny frog.

f That which externally is the cleft of the frog.

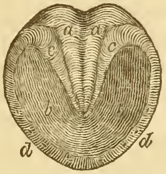
g The bars.

h The rounded part of the heels, belonging to the frog.

The colour of the hoof is a matter of some consequence. There is a common, and we believe a well-founded prejudice against white feet, and especially whiteness of the near foot. White horn is said to be weaker than that of the usual dark colour; the sole is almost uniformly flat, and the quarters are weak.

The inside of the crust is covered by numerous thin horny leaves, extending all round it, and reaching from the coronary ring to the toe. They are about 500 in number, broadest at their base, and terminating in the most delicate expansion of horn. They very much resemble the inner surface of a mushroom. In front they run in a direction from the coronet to the toe, and towards the quarters they are more slanting from behind forward. They correspond with similar cartilaginous and fleshy leaves on the surface of the coffin-bone, called, from their construction, sensible laminæ, or *lamellæ* (little leaves that have feeling), and the one being received within the other, they form together a most elastic body, by which the whole weight of the horse is supported.

THE BARS.



a a The frog.
b The sole.
c c The bars.
d d The crust.

At the back part of the foot, the wall of the hoof, instead of being continued round, and forming a circle, is suddenly bent in, as in the accompanying cut, where *d* represents the base of the crust, and *c* this inflexion or bending of it. The cut will shew that we do not refer to that bend, which forms the cleft of the frog, but to a more sudden one, constituting the commencement of THE BARS. The bars are, in fact, a continuation of the crust, forming an acute angle, and meeting at a point at the toe of the frog *a*: and the inside of the bars, like the inside of the crust (see the preceding cut), presents a continuance of the horny leaves which we have just described, shewing that it is a part of the same substance, and helping to discharge the same office.

It needs only the slightest consideration of the cut, or of the natural hoof, to shew the importance of the bars. The arch which they form on either side, between the frog and the quarters, is admirably contrived, both to admit of, and to limit to its proper extent, the expansion of the foot. When the foot is placed on the ground, and the weight of the animal is thrown on the little leaves, of which we have just spoken, we can imagine these arches shortening and widening, in order to admit of the expansion of the quarters; and we can see again the bow returning to its natural curve, and powerfully assisting the foot in regaining its usual form. We can also perceive what protection these bars must form against the contraction, or *wiring in* of the quarters. If they are taken away, there will be nothing to resist the falling of the quarters when the foot is exposed to any disease or bad management which would induce it to contract. Again, we see the security which they afford to the frog *a*; and the effectual protection which they give against the pressure of the lateral or side parts of the foot. Then appears the necessity of sparing and leaving them prominent when the foot is pared for shoeing. It is the custom with too many smiths to cut them perfectly away. They imagine that that gives a more open appearance to the heels of the horse,—a seeming width, which may impose upon the unwary. Horses shod for the purpose of sale have usually the bars removed with this view; and the smiths in the neighbourhood of the metropolis and large towns, shoeing for dealers, too often habitually pursue, with regard to all their customers, the injurious practice of removing the bars. The horny frog, deprived of its guard, will speedily contract, and become elevated and thrushy; and the whole of the heel, deprived of the power of resilience or re-action, which the curve between the bar *c* and the crust *d* affords, will speedily fall in. Therefore, when treating of shoeing, we shall lay it down as a golden rule, that the bars should be left prominent, and we shall shew why it is of essential importance that the shoe should rest on the angle formed by the crust and the bar.

THE FROG.

In the space between the bars, and accurately filling it, is the FROG. It is a triangular portion of horn, projecting from the sole, almost on a level with the crust, and covering and defending a soft and elastic substance called the *sensible frog*. It is wide at the heels, and there extending above a portion of the crust; narrowing rapidly when it begins to be confined between the bars, and terminating at a point at somewhat more than half the distance from the heel to the toe. It consists of two rounded or projecting surfaces, with a fissure or cleft between them, reaching half way down the frog, and the two portions again uniting to form the point or toe of the frog. The frog is firmly united to the sole, but it is perfectly distinct from it. It is of a different nature, being softer, and far more elastic; and it is secreted from a different surface, for it is thrown out from the substance which it covers. Without entering into many of the questions which have been agitated, with far too much warmth among veterinarians, as to the uses of the frog, it is sufficient to refer to our cut, and consider the form and situation of this part. It very much resembles a wedge with the sharp point forwards; and it is placed towards the back part of the foot. The foot is seldom put flush and flat upon the ground, but in a direction downwards, yet somewhat forwards; then the frog evidently gives safety to the tread of the animal, for it, in a manner, ploughs itself into the ground, and prevents the horse from slipping. This is of considerable consequence, when we remember some of the paces of the horse, in which his heels evidently come first to the ground, and in which the danger from slipping would be very great. We need only refer to the gallop of speed as illustrative of this.

The frog being placed at, and filling the hinder part of the foot, discharges a part of the duty sustained by the crust; for it supports the weight of the animal. It assists, likewise, and that to a material degree, in the expansion of the foot. It is formed internally of two prominences on the sides (see *a*, p. 283), and a cleft in the centre, presenting two concavities with a sharp projection in the middle, and a gradually rounded one on each side. It is also composed of a substance peculiarly flexible and elastic. What can be so well adapted for the expansion of the foot, when a portion of the weight of the body is thrown on it? How easily will these irregular surfaces yield, and spread out, and how readily return again to their natural state? In this view, therefore, the horny frog is a powerful agent in opening the foot; and the diminution of the substance of the frog, and its elevation above the ground, are both the cause and the consequence of contraction: the cause, as being able no longer powerfully to act in expanding the heels; and the consequence, as obeying a law of nature, by which that which no longer discharges its natural function is gradually removed. It is, however, the cover and defence of the internal and sensible frog, at which we are not yet arrived, and therefore we are at present unable to develop its full use; but we have said enough to shew the absurdity of the common practice of unsparingly cutting it away. To discharge, in any degree, some of the offices which we have assigned to it, and fully to discharge even one of them, it must come in occasional contact with the ground. In the unshod horse it is constantly so: but the additional support given by the shoes, and more especially the hard roads over which the horse is now compelled to travel, render this complete exposure of the frog to the ground, not only unnecessary, but injurious. Being of so much softer consistence than the rest of the foot, it would be speedily worn away: occasional pressure, however, or contact with the ground, it must have.

The rough and detached parts should be cut off at each shoeing, and the substance of the frog itself, so as to bring it just above or within the level of the shoe. It will then, in the descent of the sole, when the weight of the horse is thrown upon it in the putting down of the foot, descend likewise, and pressing upon the ground, do its duty; while it will be defended from the wear, and bruise, and injury which it would receive if it came upon the ground with the first and full shock of the weight. This will be the proper guide to the smith in operating, and to the proprietor in the directions which he gives; and the latter should often look to this, for it is a point of very great moment. A few smiths carry the notion of *frog pressure* to an absurd extent, and leave the frog beyond the level of the sole,—a practice which is dangerous in the horse of slow draught, and destructive to the hackney or the hunter; but the majority of them err in a contrary way, and, cutting off too much of the frog, lift it above the ground, and destroy its principal use. It should be left *just above, or within the level of the shoe.*

THE SOLE.

This is the under concave and elastic surface of the foot (see *b*, p. 283), extending from the crust to the bars and frog. It is not so thick as the crust, because, notwithstanding its situation, it has not so much weight or stress thrown on it as there is on the crust; and because it was intended to expand, in order to prevent concussion, when, by the descent of the bone of the foot, the weight was thrown upon it. It is not so brittle as the crust, and it is more elastic than it. It is thickest at the toe (see *t*, page 249), because the first and principal stress is thrown on that part. The coffin bone *f* is driven forward and downward in that direction. It is likewise thicker where it unites with the crust than it is towards the centre, for a similar and evident reason, because there the weight is first and principally thrown.

In a state of nature it is, to a certain degree, hollow. The reason of this is plain. It is intended to descend or yield with the weight of the horse, and by that gradual descent or yielding most materially lessen the shock which would result from the sudden action of the weight of the animal in rapid and violent action; and this descent can only be given by a hollow sole. A flat sole, already pressing upon the ground, could not be brought lower; nor could the functions of the frog be then discharged;

nor would the foot have so secure a hold. Then if the sole be naturally hollow, and hollow because it must descend, the smith must not interfere with this important action. When the foot will bear it, he must pare out sufficient of the horn to preserve the proper concavity, a small portion at the toe and near the crust, and cutting deeper towards the centre; and he must put on a shoe which shall not prevent the descent of the sole; which not only shall not press upon it, but shall leave sufficient room between it and the sole to admit of this descent. If the sole is pressed upon by the coffin-bone, by the lengthening of the elastic leaves, and the shoe will not permit its descent, the sensible part between the coffin-bone and the horn will necessarily be bruised, and inflammation and lameness will ensue. It is from this cause, that if a stone insinuates itself between the shoe and the sole, it produces so much lameness. Of the too great concavity of the sole, or the want of concavity, we shall treat when we arrive at the diseases of the foot.

THE COFFIN BONE.

We proceed to the interior part of the foot. The lower pastern, a small portion of which (see *d*, page 249) is contained in the horny box, has been already described. Beneath it, and altogether inclosed in the hoof is the coffin-bone, or proper bone of the foot, (see *f*, page 249, and *d*, fig. 1, page 253). It is fitted to, and fills the fore part of the hoof, occupying about half of it. It is of a light and spongy structure (see *d*, fig. 1, page 253), and filled with numerous holes. Through these pass the blood-vessels of the foot, which are necessarily numerous, considering the important and various secretions there carrying on, and the circulation through the foot it is plain could not possibly be kept up, if these vessels did not run through the substance of the bone. The holes about the body of the coffin-bone convey the blood to the little leaves with which it is covered; those near the lower part go to the sole. Considering the manner in which this bone is inclosed in the horny box, and yet the important surfaces around and below it which are to be nourished with blood, the circulation which is thus carried on within the very body of the bone is one of the most beautiful provisions of nature that is to be found in the whole of the frame. No inconvenience can arise from occasional or constant pressure, but the bone allows free passage to the blood, and protects it from every possible obstruction.

The fore-part of the coffin-bone is not only thus perforated, but it is curiously roughened for the attachment of the numerous little leaves about to be described. On its upper surface it presents a concavity for the head of the lower pastern, p. 253. In front, immediately above *d*, is a striking prominence, into which is inserted the extensor tendon of the foot. At the back *e*, p. 249, it is sloped for articulation with the navicular bone, and more underneath, is a depression for the reception of the perforating flexor tendon, *m*, continued down the leg, passing over the navicular bone at *n*, and at length inserted into this bone. On either side, as seen p. 254, are projections called the wings, or heels of the coffin-bone, and at the bottom it is hollowed to answer to the convexity of the internal part of the sole.

That which deserves most attention in the coffin-bone is the production of numerous little leaves round its front and sides. They are prolongations of the thick and elastic membrane covering the coffin-bone, and consist of cartilaginous, fleshy plates, proceeding from it, running down the coffin-bone, and corresponding with, and received between the horny leaves that line the inside of the crust. The horny little leaves are secreted from, or produced by the fleshy, and being, as we have stated, five hundred in number, their union with each other is so strong, that no violence can separate them. While the animal is at rest, the whole weight of the horse is supported by them, and not by the sole. This extraordinary fact has been put to the test of experiment. The sole, bars, and frog were removed from the foot of a horse, and yet as he stood, the coffin-bone did not protrude, or in the slightest degree descend; but when the rapidity with which the foot descends is added to the weight of the horse, these little leaves, horny and fleshy, gradually lengthen, and suffer the bones to press upon the sole. The sole then descends, and, in descending, expands; and so, by an admirable mechanism, the violent shock which would be produced by the pressure of such a weight as that of the horse, and the velocity with which it descends, is lessened or destroyed, and the complicated apparatus of the foot remains uninjured. When the foot is again lifted, and the weight which pressed upon it is removed, the principle of elasticity is called into exercise, and by it the sole resumes its concavity, and the horny frog its folded state;—the quarters return to their former situation,—the little leaves regain their former length, and every thing is prepared for a repetition of action.

THE SENSIBLE SOLE.

Between the coffin-bone and the horny sole is situated the sensible sole *s*, p. 249, formed above of a substance of a ligamentous or tendinous nature, and below of a cuticular or skin-like substance, plentifully supplied with blood-vessels. It was placed between the coffin-bone and the sole, by its yielding nature to assist in preventing concussion, and also to form a supply of horn for the sole. It extends beyond the coffin-bone, but not at all under the frog; leaving a space for the frog, it proceeds over the bars, and there is covered with some laminæ, to unite with those which we have described, page 283, as found in the bars. It is here likewise thicker, and more elastic, and by its elasticity is evidently assisting in obviating concussion. It is supplied with nervous fibres, and is highly sensible, as the slightest experience in horses will evince. The lameness which ensues from the pressure of a stone or of the shoe on the sole is caused by inflammation of the sensible sole. Corns result from bruise and inflammation of the sensible sole, between the crust and the bar.

THE SENSIBLE FROG.

The coffin-bone does not occupy more than one half of the hoof. The posterior part is filled by a soft mass, partly ligamentous, and partly tendinous (*o*, page 249). Its shape below corresponds with the cavities of the horny frog; in front it is attached to the inferior part of the coffin-bone; and farther back it adheres to the lower part of the cartilages of the heels, where they begin to form the rounded protuberances which constitute the heel of the foot. It occupies the whole of the back part of the foot, above the horny frog, and between the cartilages. Running immediately above the frog, and along the greater part of it, we find the perforans flexor tendon, which passes over the navicular bone, *e*, p. 249, and is inserted into the heel of the coffin-bone.

THE NAVICULAR BONE.

This navicular bone is placed behind and below the lower pastern-bone and behind and above the heel of the coffin-bone, *e*, p. 249, so that it forms a joint with both bones, and answers a very important office in strengthening the union between these parts; in receiving a portion of the weight which is thrown on the lower pastern; and in enabling the flexor tendon to act with more advantage. Supposing that this tendon were inserted into the coffin-bone, without the intervention of the navicular-bone, it would act in a very disadvantageous way, in bending the pastern, for it is inserted near the end of the coffin-bone, and the weight, concentrated about the middle of the bone, is far off, and requires a power to raise it proportionate to the distance between the weight and the power, from the centre of motion, which is here the place where the tendon passes over the end of the coffin-bone: but when the navicular bone is interposed, the centre of motion becomes the posterior edge of that bone, where it is in contact with the tendon, and then it will be seen that the distance of the power from the centre of motion is nearly or quite the same as the weight, and very great expenditure of muscular power will be saved. In the one case, the power must be at least double the weight, in the other they will be nearly equal; and also the angle at which the tendon is inserted, is, like the angle produced by the introduction of the knee-bone, considerably more advantageous. We are inclined to believe that this is the principal use of the navicular-bone; but at the same time we are aware of the benefit which accrues (see page 249) from a portion of the weight being taken from the coffin-bone, and thrown on the navicular-bone, and from it on the tendon, and the tendon resting on the elastic frog underneath. The navicular bone is sometimes, but inaccurately, said to descend with the motion of the foot. It does not do that; it cannot; for it is connected both with the pastern and coffin-bones, by inelastic ligaments. When, however, the horny bulb with its tuft of hair, at the back of an oblique fetlock, descends in the rapid gallop, and almost touches the ground, the navicular bone, being as it were a part of the pastern, must descend with it: but with this exception, both in the extending and the bending of the pastern, the navicular bone turns or rolls upon the other bones, rather than descends, or ascends, and with this remarkable advantage, that when the pastern is extended (see page 249), the navicular bone is placed in that situation which enables the flexor tendon to act with greatest advantage, in again bending the foot.

THE CARTILAGES OF THE FOOT.

There is a groove extending along the upper part of the coffin-bone, and on either side, except at the protuberance which receives the extensor tendon *d*, p. 253, occupied by cartilage, which, like the crust, is convex outwards, and concave inwards, and which extends to the very posterior part of the foot; rising about the quarters, half an inch or more above the hoof, and diminishing in height forward and backward. These cartilages occupy a greater portion of the foot than does the coffin-bone, as will be seen in the cut, page 254, where they are represented as extending far behind the coffin-bone. They are held in their situation not merely by this groove, but by other connexions with the coffin-bone, the navicular-bone, and the flexor tendon, and are thus perfectly secured.

Below are other cartilages connected with the under edges of the former, and on either side of the frog.

Between these cartilages is the sensible frog, filling up the whole of the space, and answering several important purposes, being an elastic bed on which the navicular-bone, and the tendon (see page 249), can play with security, and without concussion or shock—by which all concussion communicated to the cartilages of the foot is destroyed—and by which these cartilages are kept asunder, and the expansion of the upper part of the foot preserved. As the descent of the sole increases the width of the lower part of the foot, so the elevation of the frog, a portion of it being pressed upward and outward by the action of the navicular-bone and tendon, causes the expansion of its upper part. Precisely as the strong muscle peculiar to quadrupeds at the back of the eye (see page 88), being forcibly contracted, presses upon the fatty matter in which the eye is imbedded, which may be displaced, but cannot be squeezed into less compass, and which, being forced towards the inner corner of the eye, drives before it that important and beautiful mechanism the haw, so the elastic and yielding substance the frog, being pressed upon by the navicular-bone and the tendon, and the pastern, and refusing to be condensed into less compass, forces itself out, on each side of them, and expands the lateral cartilages, and which again, by their inherent elasticity, recur to their former situation, when the frog no longer presses them outward. It appears, that by a different mechanism, but both equally admirable, and referable to the same principle, viz. that of elasticity, the expansion of the upper and lower portions of the hoof are effected,. the one by the descent of the sole, the other by the compression and rising of the frog.

It is this expansion upward, which contributes principally to the preservation of the usefulness of the horse, when our destructive methods of shoeing are so calculated to destroy the expansion beneath. In draught horses, from the long continued as well as violent pressure on the frog, and from the frog on the cartilage, inflammation is occasionally produced, which terminates in the cartilages being changed into bony matter.

Chapter XVI.

THE DISEASES OF THE FOOT.

Of these, we have a long list to lay before our readers, but that will not be wondered at by those who have duly considered the complicated structure of the foot, the duty it has to perform, and the injuries to which it is exposed. We begin with that which is the cause of many other diseases of the foot, and connected with almost all.

INFLAMMATION OF THE FOOT, OR ACUTE FOUNDER.

The sensible lamellæ, or fleshy plates on the front and sides of the coffin-bone, being replete with blood-vessels, are, like every other vascular part, liable to inflammation, from its usual causes, and particularly from the violence with which, in rapid and long-continued action, they are lengthened and strained. When in a severely contested race they have been stretched to the utmost; while, at the fullest stride of the horse, his weight was thrown on them with destructive force; or, when the feet have been battered and bruised in a hard day's journey, no one will wonder if inflammation of the over-worked parts should ensue, and the occurrence of it may probably be produced and the disease aggravated by the too prevalent absurd mode of treating the animal. If a horse that has been ridden or driven hard be suffered to stand in the cold, or if his feet be washed and not speedily dried, he is very likely to have "fever in the feet." There is no more fruitful source of inflammation in the human being, or the brute, than these sudden changes of temperature. This has been explained as it regards grease, but it bears more immediately on the point now under consideration. The danger is not confined to change from heat to cold; a sudden transition from cold to heat is as injurious, and therefore it is that so many horses, after having been ridden far in the frost and snow, and placed immediately in a hot stable, and littered up to the knees, are attacked by this complaint. The feet and the lungs are the organs oftenest attacked, because they have previously suffered most by our mismanagement, and are most disposed to take on disease. Whatever would cause slight inflammation of other parts, or trifling general derangement, will produce all its mischief on these organs.

Sometimes there is a sudden change of inflammation from one organ to another. A horse shall have laboured for several days under evident inflammation of the lungs;—all at once that will subside, and the inflammation will appear in the feet, or inflammation of the feet may follow similar affections in the bowels or the eyes.

To the attentive observer the symptoms are clearly marked, and yet there is no disease so often overlooked by the groom and the carter, and even by the veterinary surgeon. The earliest symptoms of fever in the feet are fidgetiness, frequent shifting of the fore-legs, but no pawing, much less any attempts to reach the belly with the hind-feet. The pulse will soon be quickened, the flanks heaving, the nostrils red, and the horse, by his anxious countenance, and perhaps by moaning, indicating great pain. Presently, he will look about his litter, as if preparing to lie down, but he does not do it immediately; he continues to shift from foot; he is afraid to draw his feet sufficiently under him for the purpose of lying down: but at length he drops. The circumstance of his lying down at an early period of the disease will sufficiently distinguish inflammation of the feet from that of the lungs, in which the horse obstinately persists in standing until he drops from mere exhaustion; and his quietness when down will distinguish it from cholic or inflammation of the bowels, in both of which the horse is frequently up and down, and rolling and kicking when down. When the grievance is in the feet, the horse experiences so much relief, from getting rid of the weight painfully distending the inflamed and highly sensible little plates, that he is glad to lie as long as he can. He will likewise, as clearly as in inflammation of the lungs or bowels, point out the seat of disease by looking at the part: his muzzle will sometimes rest on the feet or the affected foot. He must be inattentive who is not aware what all this indicates

If the feet be now examined, they will be evidently hot; the horse will express pain if they are slightly rapped with a hammer, and the artery at the pastern will throb violently. No great time will now pass, if the disease be suffered to pursue its course, before he will be perfectly unable to rise; or, if he is forced to get up, and one foot be lifted, he will stand with difficulty on the other, or perhaps drop at once from intensity of pain.

The treatment will resemble that of other inflammations, with such differences as the situation of the disease may suggest. Bleeding is indispensable; and that to its fullest extent. If the disease be confined to the fore-feet, four quarts of blood should be taken as soon as possible from the toe of each, at the situation pointed out, fig. 2, p. 249, and in the manner already described;—poultices of linseed meal, made very soft, should cover the whole of the foot and the pastern, and be frequently renewed, which will promote evaporation from the neighbouring parts, and possibly through the pores of the hoof, and, by softening and suppling the hoof, will relieve its painful pressure on the swelled and tender parts beneath. More fully to accomplish this last purpose, the shoe should be removed, the sole pared as thin as possible, and the crust and particularly the quarters well rasped. All this must be done gently, and with a great deal of patience, for the poor animal can scarcely bear his foot to be meddled with. There is doubt as to the propriety of administering physic. The horse may find it difficult or impossible to rise, in which case much inconvenience will ensue from the operation of physic: or there may be danger, from the intense character which fever in the feet often assumes, of producing a change of inflammation to the bowels or lungs, in which the irritation of physic would probably be fatal. Sedative and cooling medicines should be diligently administered, consisting of digitalis, nitre, and emetic tartar, in the proportions already recommended.

If no amendment be observed, three quarts of blood should be taken from each foot on the following day, and, in extreme cases, a third bleeding of two quarts may be justifiable, and, instead of the poultice, cloths kept wet with water in which nitre has been dissolved *immediately before*, and in the proportion of an ounce of nitre to a pound of water, may be wrapped round the feet. About the third day a blister may be tried, taking in the whole of the pastern and the coronet; but a cradle must previously be put on the neck of the horse, and the feet must be covered after the blister, or they will probably be sadly blemished. The horse should be kept on mash diet, unless green meat can be procured for him; and even that should not be given too liberally, nor should he, in the slightest degree, be coaxed to eat. When he appears to be recovering, his getting on his feet should not be hurried. It should be left perfectly to his own discretion; nor should even walking exercise be permitted until he stands firm on his feet; when, if the season will permit, two months' run at grass will be very serviceable.

It is not, however, always, or often, that inflammation of the feet is thus easily subdued; and, if it be subdued, it sometimes leaves after it some fearful consequences. The loss of the hoof is not an unfrequent one. About six or seven days from the first attack, a slight separation will begin to appear between the coronet and the hoof. This should be carefully remarked, for the separated horn will never again unite with the parts beneath, but the disunion will extend, and the hoof will be lost. It is true that a new hoof will be formed, but it will be smaller in size and weaker than the first, and will rarely stand hard work. When this separation is observed, it will be a matter of calculation with the proprietor of the horse whether he will suffer the medical treatment to proceed.

PUMICED FEET.

The sensible and horny little plates which were elongated and partially separated during the intensity of the inflammation will not always perfectly unite again, or will have lost much of their elasticity, and the coffin-bone, no longer fully supported by them, presses upon the sole, and the sole becomes flattened, or even convex, or projecting, by this unnatural weight, and the horse acquires a PUMICED FOOT. This will also happen when the animal is used too soon after an attack of inflammation of the feet, and before the little plates have regained sufficient strength to support the weight of the horse, or to contract again by their elastic power when they have yielded to the weight. When the coffin-bone is thus thrown on the sole, and renders it pumiced, the crust at the front of the hoof will "*fall in,*" leaving a kind of hollow about the middle of it.

Pumiced feet, especially in horses with large wide feet, are produced not unfrequently without this acute inflammation. Undue work, and especially much battering of the feet on the pavement, will extend and sprain these little plates so much, that they will not have the power to contract, and thus the coffin-bone will be thrown backward on the sole. A very important law of nature will unfortunately soon be active here: when pressure is applied to any part, the absorbents become busy in removing that part; so, when the coffin-bone begins to press upon the sole, the sole becomes thin from the increased wear and tear to which it is subjected from contact with the ground, and also because these absorbents are rapidly taking it away.

This is one of the diseases of the feet for which there is no cure. No skill is competent to effect a re-union between the separated fleshy and horny leaves, or to restore to them the strength and elasticity of which they have been deprived, or to take up that hard horny substance which very speedily fills the space between the crust and the receding coffin-bone. Some efforts have been made to palliate the disease, but they have been only to a very slight extent successful. If horses, on the first appearance of flat foot, were turned out in a dry place, or put into a box for two or three months, sufficient stress would not be thrown on the leaves to increase the evil, and time might be given for the growth of horn enough in the sole to support the coffin-bone; yet we much doubt whether these horses would ever be useful even for ordinary purposes. The slowest work required of them would drive the coffin-bone on the sole, and gradually the projection would reappear, for no power and no length of time can again unite the separated leaves of the coffin-bone and the hoof. All that can be done in the way of palliation is by shoeing. Nothing must press on the projecting and pumiced part. If the projection be not great, a thick bar shoe is the best thing that can be applied, but should the sole have much descended, a shoe with a very wide web, bevelled off so as not to press on the part, may be used. These means of relief, however, are only temporary, the disease will proceed; and, at no great distance of time, the horse will be useless.

CHRONIC FOUNDER.

This is a name conveniently contrived to express those alterations of the foot, and the gradual lameness which either shoeing or mismanagement occasions. It is often a mere cloak for our ignorance of these subjects. The diseases of the foot and their remedies are very imperfectly understood even by the most skilful practitioners.

We may, perhaps, most conveniently divide the slow and fatal progress from soundness to incurable lameness into two classes—that which is accompanied by contraction, and that which exhibits little or no alteration in the external appearance of the foot.

CONTRACTION.

Our cut, page 283, will give us a fair idea of the young healthy foot, approaching nearly to a circle, and of which the quarters form the widest part, and the inner quarter (this is the near foot) rather wider than the outer. This shape is not long preserved in many horses, but the foot increases in length, and narrows in the quarters, and particularly at the heel, and the frog is diminished in width, and the sole becomes more concave, and the heels higher, and lameness, or at least a shortened and feeling action, ensues.

Here we must premise that there is a great deal more horror of contracted heels than there is any occasion for. Many persons reject a horse at once if the quarters are *wiring in;* but the fact is, that although this is an unnatural form of the hoof, it is slow of growth, and nature kindly makes that provision for the slowly altered form of the hoof, which she does in similar cases: she accommodates the parts to the change of form. As the hoof draws in, the parts beneath, and particularly the coffin-bone and the heels of the coffin-bone, diminish; or, after all, as it is more a change of form than of capacity, as the foot lengthens in proportion as it narrows, so the coffin-bone lengthens, and is as perfectly adjusted as before to the box in which it is placed; and its little leaves are in as intimate and perfect union with those of the crust as before the hoof had begun to change. On this account it is that many horses with very contracted feet are perfectly sound, and no horse should be rejected merely because he has contracted feet. He should undoubtedly be examined more carefully, and with considerable suspicion; but if he has good action, and is otherwise unexceptionable, there is no reason that the purchase should be set aside. For our own parts, we had rather have a horse with contracted feet, if he went sound, than another with open but weak heels. We should expect from him much more work, and we should not be disappointed.

We must also protest against the opinion that contraction is the necessary consequence of shoeing. There can be no doubt that an inflexible iron ring being nailed to the foot prevents, to a very considerable degree, the descent of the sole and the expansion of the heels below; and it is likewise probable, that when the expansion of the heels is prevented they will often begin to contract. But here again, nature, cut off from one resource, finds others. If one of the jugular veins be lost, the blood finds its way by other channels, and the horse does not appear to suffer in the slightest degree: and so if the expansion of the heels below is diminished, that of the cartilages above is made more use of. If the coffin-bone has not so much descent downward, it probably acquires one backward, and the functions of the foot are usefully if not perfectly performed. The plain proof of this is, that although there are many horses that are injured or ruined by bad shoeing, there are others, and they are a numerous class, who suffer not at all from good shoeing, and scarcely even from bad. Except it be from accident, how seldom is the farmer's horse lame; and it might even be further asked, how seldom is his foot much contracted? Some gentlemen who are careful of their horses have driven them twenty years, and principally over the rough pavement of towns, without a day's lameness. Shoeing may be a necessary evil, but it is not the evil which some speculative persons have supposed it to be: and the undoubted fact is, that when the horse is put to real hard work, and when the injury produced by shoeing in destroying the expansibility of the foot would most of all shew itself, the foot lasts a great deal longer than the leg; nay, horsemen will tell us that one pair of good feet is worth two pair of legs.

Having thus premised that contraction is not necessarily accompanied by lameness, and that shoeing, with all its evils, does not necessarily injure the foot, we proceed to consider those cases of contraction, too numerous, which are the consequence of our stable management, and which do cripple and ruin the horse. We are not aware of anything in the appearance of the feet which would enable us to decide when contraction is or is not destructive to the usefulness of the animal; his manner of going, and his capability for work, must be our guides. Lameness usually accompanies the beginning of contraction; it is the invariable attendant on rapid contraction, but it does not always exist when the *wiring in* is slow or of long standing.

A very excellent writer, particularly when treating of the foot of the horse, Mr. Blaine, has given us a long and correct list of the causes of injurious contraction, and most of them are, fortunately, under the control of the owner of the animal. He places at the head of them, *neglect of paring.* The hoof is continually growing, the crust is lengthening, and the sole is thickening. This is a provision for the wear and tear of the foot in an unshod state; but when the foot is protected by a shoe, and none of the horn can be worn away by coming in contact with the ground, the growth of horn continues; the hoof gets high, and the sole gets thick; and in consequence of this, the descent of the sole and the expansion of the heels are prevented, and contraction is the result. The smith might lessen, if not prevent the evil, by carefully thinning the sole and lowering the heels at each shoeing; but the first of these is a matter of considerable labour, and the second could not be done effectually without being accompanied by the first, and therefore they are both neglected. The prejudice of many owners of horses assists in increasing the evil. They imagine that a great deal of mischief is done by *cutting away the foot.* Mischief may be the result of injudicious cutting, when the bars are destroyed and the frog is elevated from the ground; but more evil results from the unyielding thickness of horn impairing the elastic and expansive principle of the foot. If gentlemen would stand by, and see that the sole is properly thinned, and the heels lowered, and occasionally, perhaps, give the workman a trifling gratuity for his increased labour, they would be repaid in the comfort and usefulness of the horse.

Ill-judged economy is another source of this disease. If the shoes of one veterinary surgeon will, with ordinary work, last a little more than three weeks, while another contrives to make his last six, he is supposed to be the better workman and the more honest man, and gets the greater part of the custom; and his shoe is suffered to remain on during the whole time, to the manifest injury of the feet, and that injury materially increased, by the greater thickness and weight of these shoes, and the tightness with which they are fastened on, the nails being necessarily placed nearer to the quarters, and possibly an additional nail or two used in the fastening, and these applied at the quarters. There is no rule which admits of so little exception,—that once in about every three weeks the growth of horn which the natural wear of the foot cannot get rid of, should be pared away—the toe should be shortened—the sole should be thinned, and the heels lowered. Every one who has carefully observed the shape of the horse's foot, must have seen, that in proportion to its height or neglected growth, it contracts and closes upon the foot round the coronet. A low-heeled horse may have other serious defects, of which it will be our duty to speak, but he has seldom a contracted foot.

Another source of contraction is the want of natural moisture. The unshod colt has seldom contracted feet, nor does the horse at grass acquire them, because the hoof is kept cool and damp by occasional rain and by the regular dew. It is thus rendered supple, and its elasticity is preserved, and the expansive power of the foot is uninjured. The hoof of the stabled horse sometimes has not one drop of moisture on it for several days. The effect of this, in causing the horn to shrink, is sufficiently evident. Hence the propriety of stopping the feet. The intelligent and careful groom will not omit it a single night. Cow-dung, with a small portion of clay to give it consistence, is a common and very good stopping: a better one is a piece of thick felt cut to the shape of the sole and soaked in water; this may be procured, ready prepared for use, at any saddler's. The common stopping of tar and grease is peculiarly objectionable, closing the pores of the feet, and ultimately increasing the dryness and brittleness which it was designed to remedy.

The usual management of the farmer's horse, which is often turned out after his daily task is exacted, or at least whose work returns with the day, and is generally performed where the feet are exposed to moisture, is an excellent preventive against contraction.

Some intelligent persons have complained much of the influence of litter. If the horse stand many hours in the day with his foot embedded in straw, it is supposed that the hoof must be unnaturally heated; and it is said that the horn will curl and contract under the influence of heat. It is seldom, however, that the foot is so surrounded by the litter, that its heat will be sufficiently increased to produce this effect on the thick horn. The heels, sometimes embedded in straw, and then receiving the current of cold air which blows in from the door, may suffer, and grease may result, but the foot is not sufficiently long or deeply covered by the litter to produce a temperature high enough to warp the hoof. We confess, therefore, that we are not the disciples of those who would, during the day, remove all litter from under the horse; we do not like the naked and uncomfortable appearance of the stable; and we cannot forget the difference in our own feelings, whether we stand for an hour or two on the hard stones, or a soft carpet, and especially whether we beat our feet upon the one or the other. We are disposed to say that humanity and a proper care of the foot of the horse should induce us to keep some litter under him during the day; but his feet need not sink so deeply in it that their temperature should be much affected.

Thrushes are much oftener the consequence than the cause of contraction. The horny frog, yielding to the pressure of the contracted quarters, is diminished in size, and the lower portion of the fleshy frog becomes imprisoned, irritated, and inflamed, and pus or matter is discharged at the cleft; yet there are many heels in the last stage of contraction, which are not thrushy. On the other hand, thrush never long existed, accompanied by much discharge, without producing a disposition to contraction; therefore, thrush may be considered as both the cause and consequence of contraction.

The removal of the bars takes away a main impediment to contraction. Their use in assisting the expansion of the foot has been already stated, and should a disposition to contraction be produced by any other cause, the cutting away of the bars would hasten and aggravate the evil; but the loss of the bar would not of itself produce contraction.

The contraction, however, which is connected with permanent lameness, although increased by the circumstances which we have mentioned, usually derives its origin from a different source, and from one which acts violently and suddenly. Inflammation of the little plates covering the coffin bone is the most usual cause; and a degree of inflammation not sufficiently intense to be characterised as acute founder, but quickly leading to sad results, may and does spring from causes almost unsuspected. There is one fact to which we have alluded, and that cannot be doubted, that contraction is exceedingly rare in the agricultural horse, but frequently occurs in the stable of the gentleman and the coach proprietor: it is rare, where the horse is seemingly neglected and badly shod; and frequent, where every care is taken of the animal, and the shoes are unexceptionable and skilfully applied. Something may depend upon the breed. Blood horses are particularly liable to contraction;—not only is the foot naturally small, but it is disposed to become narrower at the heels. The broad, flat foot of the cart-horse is subject to diseases enough, but contraction is seldom one of the number. In horses of equal blood, not a little seems to depend upon the colour, and the dark chesnut is proverbially prone to contraction.

There is, however, something in the management or use of the horse that lies at the root of the evil, and that is not difficult to discover or to understand. The over-feeding of many horses disposes them to inflammation, and with this disposition they are suffered to stand inactive in the stable for one, or two, or three days: the exquisitely sensible little plates are scarcely elongated; they are becoming unused to exertion; they are diminishing from lack of use. The horse is then taken from the stable, and, without preparation, is galloped over the stones, or is ridden far and fast on the road or in the field. Is it to be wondered at, if the sudden concussion of the whole foot and the violent elongation of the little plates should produce sufficient pain and inflammation to interfere with the function, and alter the structure of various parts of the foot? From the alteration of structure or partial separation between the external and internal portions of the foot, the expansion of the quarers becomes limited, or ceases, and in consequence of this, the crust becomes contracted and falls in.

Whatever be the cause of that rapid contraction or narrowing of the heels which is accompanied by severe lameness, the symptoms may be easily distinguished. While standing in the stable, the horse will point with, or place forward, the contracted foot, or, if both feet be affected, he will alternately place one before the other: when he is taken out of the stable, he will not, perhaps, exhibit the decided lameness which characterizes sprain of the flexor tendon, or some diseases of the foot; but his step will be peculiarly short and quick, and the feet will be placed gently and tenderly on the ground, and scarcely lifted from it in the walk or the trot. It would seem as if the slightest irregularity of surface would throw the animal down, and so it threatens to do, for he is constantly tripping and stumbling. If the fore-feet are carefully observed, one or both of them will be narrowed across the quarters and towards the heels. In a few cases, the whole of the foot appears to be contracted and shrunk; but in the majority of instances, while the heels are narrower, the foot is longer. The contraction appears sometimes in both, heels; at other times in the inner heel only, or, if both be affected, the inner one is *wired in* the most; either generally from the coronet to the base of the foot, or, in some instances, only or principally at the coronet; oftener near the base of the foot; but in most cases the hollow is greatest about mid-way between the coronet and the bottom of the foot. This irregularity of contraction, and uncertainty as to the place of it, prove that it is some internal disorganization, the seat of which varies with the portion of the attachment between the hoof and the foot which was principally strained or injured. In every recent case the contracted part will be hotter than the rest of the foot, and the sole will, in the majority of cases, be unnaturally concave, and that sometimes to a very great degree.

Of the treatment of contraction attended with lameness we have very little to say that will be satisfactory; numberless have been the mechanical contrivances to oppose the progress of contraction, or to force back the foot to its original shape, and many of them have enjoyed considerable but short-lived reputation. A clip was placed at the inside of each heel of the shoes, which, resting on the bars, was intended to afford an insurmountable obstacle to the further wiring in of the foot, while the heels of the shoe were bevelled outward to give the foot a tendency to expand. The foot, however, continued to wire in, until the clip was imbedded in the horn, and worse lameness was produced.

A shoe jointed at the toe, and with a screw adapted to the heels, was contrived, by which, when softened by poulticing, or immersion in warm water, the quarters were to be irresistibly widened. They were widened by the daily and cautious use of the screw until the foot seemed to assume its natural form, and the inventor began to exult in having discovered a cure for contraction ; but no sooner was the common shoe again applied and the horse returned to his work, than the heels began again to narrow, and the foot became as contracted as ever. Common sense would have foretold that such must have been the result of this expansive process ; for the heel could have been only thus forced asunder, at the expense of partial or total separation from the interior portions of the foot with which they were in contact.

The contracted heel can rarely or never permanently expand, for this plain reason, that although we have power over the crust, we cannot make the lengthened and narrowed coffin-bone resume its natural shape, or restore the portion of the frog which has been absorbed.

If the action of the horse be not materially impaired, it is better to let the contraction alone, be it as great as it will. If the contraction has evidently produced considerable lameness, then the owner of the horse will calculate between his value if cured, the expense of the cure, and the probability of failure.

The medical treatment can only be undertaken by a skilful veterinarian, and it will principally consist in getting rid of any inflammation that may then exist, by local bleeding and physic ; next, paring the sole to the utmost extent that it will bear ; rasping the quarters as deeply as may be, so that they shall not be too much weakened, or the coronary ring (see *b*, p. 281) injured ; then rasping deeply likewise at the toe, and perhaps scoring at the toe. The horse is afterwards made to stand during the day in wet clay, placed in one of the stalls of his stable, and he is moved at night into another stall, and his feet bound up thickly in wet cloths ; or he is turned out into wet pasturage, with tips, or, if possible, without them, and his feet are frequently pared out, and the quarters lightly rasped. In five or six months the horn will have grown fairly down, when he may be taken up, and shod with shoes, unattached by nails on the inner side of the foot, and put to gentle work. The foot will be found very considerably enlarged, and the owner will, perhaps, think that the cure is accomplished ; and the horse may, possibly, for a time stand very gentle work, and the inner side of the foot being left at liberty, its natural expansive process may be resumed. The internal part of the foot, however, has not healthily filled up with the expansion of the crust. If that expansion has been effected forward on the quarters, the crust will no longer be in contact with the lengthened and narrowed heels of the coffin-bone ; there will not be the natural adhesion and strength, and a very slight cause, or even the very habit of contraction, will, in spite of all our care and the freedom of the inner quarter, in very many instances, cause the foot to wire in again as badly as before.

THE NAVICULAR-JOINT DISEASE.

Many horses with well-formed and open feet become sadly and permanently lame; and veterinary surgeons have been much puzzled to find out why. The farrier has had his convenient explanation "the shoulder;" but the scientific practitioner has not been able to discover an ostensible cause of lameness in the whole limb. There is no one accustomed to horses who does not recollect many an instance of this. Mr. James Turner has, of late years, thrown very considerable light on the seat and cause of this disease, although, as in contracted feet, the most skilful surgeon will rarely effect a cure.

By reference to our cut, *e*, page 249, it will be seen that, behind and beneath the lower pastern-bone, and behind and above the heel of the coffin-bone, is a small bone called the navicular or shuttle bone. It is so placed as to strengthen the union between the lower pastern and the coffin-bone, and to enable the flexor tendon, which passes over it, in order to be inserted into the bottom of the coffin-bone, to act with more advantage; it forms a kind of joint with that tendon. There is a great deal of weight thrown on the navicular-bone, and from the navicular-bone on the tendon; and there is a great deal of motion or play between them in the bending and extension of the pasterns. Now it is very easy to conceive that from sudden concussion, or from rapid and overstrained motion, and that perhaps after the animal has been some time at rest, and the parts have not adapted themselves for motion, that there may be too much play between the bone and the tendon; that the delicate membrane which covers the bone, or the cartilage of the bone, may be bruised, and inflamed, and destroyed; and that all the painful effects of an inflamed and opened joint may ensue, and the horse may be dreadfully lame. Numerous dissections have shewn that this joint, formed by the tendon and the bone, has been the frequent, and, we believe it to be, the almost invariable seat of these obscure lamenesses. The membrane covering the cartilage of the bone has been found in an ulcerated state; the cartilage itself has been ulcerated and eaten away; and the bone has become carious or decayed, and bony adhesions have often taken place between the navicular and the pastern and the coffin-bones, and this part of the foot has become completely disorganised and useless. This joint is probably the seat of lameness, not only in flat and perfect feet, but in those which become lame *after* contraction; for in proportion as the inner frog is compressed by the contraction of the heels, and the frog is absorbed by that pressure, and the sole is become concave, and the horny frog, and the coffin-bone too, thereby elevated (see cut, page 269), will there be less room for the action of this joint, and more danger of the tendon and the delicate membrane of the navicular-bone being crushed between that bone and the horny frog.

Stable management has little to do with the production of this disease, any further than if a horse stands idle in the stable several days, and the structure of the foot, and all the apparatus connected with motion, become unused to exertion, and indisposed for it, and he be then suddenly and violently exercised, this membrane is very liable to be bruised and injured. Irregular and undue exercise are the causes in all feet; but the contracted foot, from its alteration of form, is most in danger.

The cure is extremely uncertain. The first object is to abate the inflammation in this very susceptible membrane. Local bleeding, poulticing, and physic will be our principal resources. If there be contraction, this must, if possible, be removed by the means already pointed out. If there be not contraction, it will be prudent to remove all surrounding pressure by paring the sole and rasping the quarters, and using the shoe without nails on the inner quarter. This is a case, however, which must be turned over to the veterinary surgeon, for he alone, from his knowledge of the anatomy of the foot, and the precise seat of the disease, is competent to treat it. If attacked on its earliest appearance, and before ulceration of the membrane of the joint has taken place, it may be radically cured, but ulceration of the membrane will be with difficulty healed, and caries of the bone will for ever remain. Blistering the coronet will often assist in promoting a cure by diverting the inflammation to another part, and it will materially quicken the growth of the horn; and a seton passed through the frog by a skilful operator, and approaching as nearly as possible to the seat of disease, has been serviceable.

In cases of old contraction, attended by a short and *feeling* step, *neurotomy*, or the cutting out of a portion of the nerve, (for an explanation of the nature and effects of which see page 110,) may be resorted to with decided advantage. Not only will the lameness be removed, but, by the foot being again brought fully and firmly upon the ground, the inner side of the shoe being unfettered by nails, a portion of the contraction may be removed by the sole being allowed to descend and the foot to expand at each contact with the ground.

Even when the navicular joint is particularly suspected, if there be no apparent inflammation, (and that would be readily detected by the heat of the foot,) neurotomy may be practised with the hope of alleviating the sufferings of the animal, and thus removing a portion of the lameness; but if the lameness be extreme, either with or without contraction, and especially if there be heat about the foot, the operation is dangerous. There is, probably, ulceration of the membrane—possibly, decay of the bone; and the additional friction to which the parts would be subjected, by the freer action of the horse, the sense of pain being removed, would cause that ulceration or decay to proceed more rapidly until the foot would be completely disorganized, or the tendon would be gradually worn through by rubbing against the roughened surface of the bone.

SAND-CRACK.

This, as its name imports, is a *crack* or division of the hoof from above downward, and into which *sand* and dirt are too apt to insinuate themselves; or, as some say, because it most frequently occurs in sandy districts, the heat of the sand applied to the feet, giving them a disposition to crack. They occur both in the fore and the hind feet. In the fore feet they are usually found in the inner quarter (see *g*, p. 254), but occasionally in the outer quarter, because at the quarter is the principal stress or effort towards expansion in the foot, and the inner quarter is weaker than the outer. In the hind feet the crack is almost invariably found in the front, because in the digging of the toe into the ground in the act of drawing, the principal stress is in front.

This is a most serious defect. It indicates a brittleness of the crust, sometimes natural, but oftener the consequence of mismanagement or disease, which, in spite of every means adopted, will probably be the source of future annoyance. On a hoof that has once been thus divided no dependence can be placed, unless, by great care, the natural suppleness of the horn has been restored and is retained.

Sand-crack may happen in an instant from a false step or over-exertion; and therefore a horse, although he may spring a sand-crack within an hour after the purchase, cannot be returned on that account.

It is always necessary to examine the inner quarter of the foot at the time of purchase, for it has more than once occurred that, by low dealers, and particularly at fairs, a sand-crack has been neatly covered with pitch, and then the whole of the hoof having been oiled, the injury was so adroitly concealed that an incautious person might be easily deceived.

The crack sometimes does not penetrate through the horn: it then causes no lameness; nevertheless, it must not be neglected. It shews that brittleness which should make the purchaser pause; and, if proper means are not taken, it will generally soon reach to the quick. It should be pared or rasped fairly out; and if the paring or rasping has been deep, the foot should be strengthened by a coating of pitch, with coarse tape bound over it, and covered by another coating of pitch, and which may be moulded and polished so as to be scarcely distinguishable from the natural horn. Every crack should be pared or rasped to ascertain its depth. If it penetrates through the crust, and no lameness exists, and is situated low down on the foot, a firing iron, red-hot, should be run pretty deeply above and below it to prevent its lengthening; the edges should be a little thinned to remove any painful or injurious pressure; and it should be bound up in the manner directed, taking care that the shoe does not press upon the crust immediately under the crack.

If the crack has penetrated through the crust, and lameness has ensued, the case is more serious. It must be carefully examined to ascertain that no dirt or sand has got into it; the edges must be considerably thinned; and if any fungus is beginning to sprout through the crack, and is imprisoned and pinched there, it must be destroyed by the application of the butyr (chloride) of antimony. This is far preferable to the cautery, because the edges of the horn will not be thickened or roughened, and thus become a source of after irritation. The iron must then be run deeply above and below the crack, as in the other case; a pledget of dry tow must be placed in the crack, with another over it, and the whole bound down as tightly as possible. On the third day the part should be examined, and the caustic again applied if necessary; but if the crack be dry, and defended by a hard horny crust, the sooner the pitch plaster is put on the better. The most serious case is when, from *tread* or neglect, the coronet is divided. The growth of horn proceeds from the coronary ligament, and unless this is perfect the horn will grow down divided. The method to be here adopted is to run the back of the firing-iron over the coronet at the division. Some inflammation will ensue, and when the scab produced by the cautery peels off, as it will in a few days, the division will be obliterated, and sound and united horn will grow down. In this case, as in almost every case of sand-crack, the horse should be kept as quiet as possible. It is not in the power of the surgeon to effect a perfect cure if the owner will continue to use the animal. When the horn is divided at the coronet it will take five or six months for it to grow fairly down, and not before it is grown fairly down should the horse be used, even for ordinary work: but when the horn is grown an inch from the coronet the horse may be turned out, the foot being well defended by the pitch plaster, and that renewed as often as it becomes loose, a bar shoe being worn chambered so as not to press upon the hoof immediately under the crack, and that shoe being taken off, the sole pared out, and any bulbous projection of the new horn being removed once in every three weeks.

To remedy the undue brittleness of the hoof, we know no better application than that recommended in page 182, the sole being covered at the same time with the common cow-dung or felt stopping.

TREAD, OR OVERREACH.

Under this term are comprised bruises and wounds of the coronet, produced usually in the hind-feet, by the awkward habit of setting one foot upon another, and in the fore-foot by the hinder one *over-reaching* it, and wounding the other near the heel. When properly treated, a tread is seldom productive of much injury. If the dirt be well washed out of it, and a pledget of tow dipped in Friar's balsam be bound over the wound, it will, in the majority of cases, speedily heal. Should the bruise be extensive or the wound deep, a poultice may be applied for one or two days, and then the Friar's balsam, or digestive ointment. Sometimes a soft tumour will form on the part, which will be quickly brought to suppuration by a poultice, and when the matter has run out the ulcer will heal by the application of the Friar's balsam, or a weak solution of blue vitriol.

A tread, or wound of the coronet, should never be neglected, lest gravel should insinuate itself into the wound, and form deep ulcerations called *sinuses* or *pipes*, and which constitute *quittor;* and more particularly the caustic, too frequently used by farriers, should be carefully avoided, not only lest quittor should be formed, but lest the coronary ligament should be so injured as to be afterwards incapable of throwing out perfect horn. This defect is called

FALSE QUARTER.

If the coronary ligament by which the horn of the crust is secreted is either divided by the original cut or bruise, or eaten through by the caustic, there will be a division in the horn as it grows down, either in the form of a permanent sand-crack, or one portion of the horn overlapping the other. This is not only a very serious defect, and a frequent cause of lameness, but it is exceedingly difficult to remedy. The coronary ligament must be restored to its perfect state, or at least to the discharge of its perfect function. Much danger would attend the application of the caustic in order to effect this. A blister is rarely sufficiently active, and the application, not too severely, of a heated flat or rounded iron to the coronet at the injured part affords the best chance of success; the edges of the horn on either side of the crack being thinned, the hoof supported, and the separated parts held together by a firm encasement of pitch, as described when speaking of the treatment of sand-crack. The coronet must be examined at least once in every fortnight in order to ascertain whether the desired union has there taken place; and, as a palliative, during the treatment of the case, or if the treatment should be unsuccessful, a bar shoe may be used, and care taken that there be no bearing at or immediately under the separation of the horn. This will be best effected, if the crust be thick and the quarters strong, by paring off a little of the bottom of the crust at the part, so that it shall not touch the shoe; but if the foot be weak, an indentation, or hollow, should be made in the shoe. Strain or concussion on the immediate part will thus be avoided, and in sudden or violent exertion the crack will not be so likely to extend upward again to the coronet, when whole and sound horn has begun to be formed there.

In some cases false quarter assumes a less injurious character. The horn grows down whole, but the ligament is unable to secrete that which is perfectly healthy, and therefore there is a narrow slip of horn of a different and lighter colour. This is sometimes the best result that can be procured when the surgeon has been able to obliterate the absolute crack or separation. It is, however, to be regarded as a defect, not sufficient to condemn the horse, but indicating that he has had sand-crack, and that a disposition to sand-crack may possibly remain. There will also, in the generality of cases, be some degree of tenderness in that quarter, which may produce slight lameness when unusual exertion is required from the horse, or the shoe is suffered long to press on the part.

QUITTOR.

This has been described as being the result of neglected or bad tread or overreach; but it may be the consequence of any wound in the foot, and in any part of the foot. In the natural process of ulceration, matter is thrown out from the wound. This precedes the actual healing of the part. The matter which is thrown out in wounds of the foot is usually pent up there, and, increasing in quantity, and thus urging its way in every direction, it forces the fleshy little plates of the coffin-bone, from the horny ones of the crust, or the horny sole from the fleshy sole, or even eats deeply into the internal parts of the foot. These pipes or sinuses run in every direction, and constitute the essence of *quittor*.

If it arise from a wound in the bottom of the foot, the matter which is rapidly formed is pent up there, the nail of the shoe or the *stub* remains in the wound, or the small aperture which was made is immediately closed again. This matter, however, continues to be thrown out, and it separates the horny sole from the fleshy one to a considerable extent, and at length forces its way upward, and appears at the coronet, and usually at the quarter, and there slowly oozes out; but the aperture and the quantity discharged are so small that the inexperienced person would form no idea of the extent of the mischief within, and the difficulty of repairing it. The opening may scarcely admit a probe into it, yet over the greater part of the quarter and the sole the horn may have separated from the foot, and the matter may have penetrated under the cartilages and ligaments, and into the coffin joint; and not only so, but two mischievous results have been produced,—the pressure of the matter wherever it has gone has formed ulcerations that are indisposed to heal, and that require the application of strong and painful stimulants to induce them to heal; and, worse than this, the horn, once separated from the sensible parts beneath, will never again unite with them.

It will be sufficiently plain that the aid of a skilful practitioner is here requisite, and also the full exercise of the patience of the proprietor of the horse. It may be necessary to remove much of the horny sole, which will be speedily reproduced when the fleshy surface beneath can be brought to a healthy condition; but if much of the horn at the quarters must be taken away, five or six months may probably elapse before it will be sufficiently grown down again to render the horse useful.

Measures of considerable severity are indispensable. The application of some caustic will alone produce a healthy action on the ulcerated surfaces; but on the ground of interest and of humanity we protest against that brutal practice, or at least the extent to which it is carried, of coring out, or deeply destroying the healthy as well as the diseased parts, and parts which no process will again restore, which is pursued by many ignorant smiths. The unhealthy surface must be removed, but the cartilages and ligaments, and even portions of the bone, need not be sacrificed.

The experienced veterinary surgeon will alone be able to counsel the proprietor of the horse when, in cases of confirmed quittor, there is reasonable hope of permanent cure. A knowledge of the anatomy of the foot is necessary to enable him to decide what parts, indispensable to the action of the animal, may have been irreparably injured or destroyed, or to save these parts from the destructive effect of torturing caustics. When any portion of the bone can be felt by the probe the chances of success are diminished, and the owner and the operator should pause. When the joints are exposed the case is hopeless; yet, in a great many instances, the bones and the joints are exposed by the remedy and not by the disease. One hint may not be necessary to the practitioner, but it may guide the determination and hopes of the owner: if, when a probe is introduced into the fistulous orifice on the coronet, the direction of the *sinuses* or *pipes* is backward, there is much probability that a perfect cure may be effected; but if the direction of the sinuses be forward, the cure is at best doubtful. In the first instance, there is neither bone nor joint to be injured; in the other, the more important parts of the foot are in danger, and the principal action and concussion are found.

Neglected bruises of the sole sometimes lay the foundation for quittor. When the foot is flat, it is very liable to be bruised if the horse is ridden fast over a rough and stony road; or a small stone, insinuating itself between the shoe and the sole, or clipped and confined by the curvature of the shoe, will frequently lame the horse. The heat and tenderness of the part, the occasional redness of the horn, and the absence of puncture, will clearly mark the bruise. The sole must then be thinned, and particularly over the bruised part, and, in neglected cases, it must be pared even to the quick, in order to ascertain whether the inflammation has run on to suppuration. Bleeding at the toe will be clearly indicated,—poultices,—and such other means as have either been described under "Inflammation of the Feet," or will be pointed out under the next head. The principal causes of bruises of the foot are leaving the sole too much exposed by means of a narrow-webbed shoe, or the smith paring out the sole too closely, or the pressure of the shoe on the sole, or the introduction of gravel or stones between the shoe and the sole.

PRICK OR WOUND IN THE SOLE OR CRUST.

This is the most frequent cause of quittor. It is evident that the sole is very liable to be wounded by nails, pieces of glass, or even sharp flints, but much more frequently the fleshy little plates are wounded by the nail in shoeing; or if the nail does not penetrate through the internal surface of the crust, it is driven so close to it that it presses upon the fleshy parts beneath, and causes irritation and inflammation, and at length ulceration. When a horse becomes suddenly lame, after the legs have been carefully examined and no cause of lameness appears in them, the shoe should be taken off. In many cases the offending substance will be immediately detected, or the additional heat felt in some part of the foot will point out the seat of injury; or, if the crust be rapped with the hammer all round, the flinching of the horse will discover it; or pressure with the pincers will render it evident.

When the shoe is removed for this examination the smith should never be permitted to wrench it off, but each nail should be drawn separately, and examined as it is drawn, when some moisture appearing upon it will not unfrequently reveal the spot at which matter has been thrown out. In the fore-foot the injury will generally be found on the inner quarter, and on the hind-feet near the toe, these being the thinnest parts of the fore and hind-feet.

Sudden lameness occurring within two or three days after the horse has been shod will lead us to suspect that the smith has been in fault; yet no one who considers the thinness of the crust, and the difficulty of shoeing many feet, will blame him for sometimes pricking the horse. His fault will consist in concealing or denying that of which he will almost always be aware at the time of shoeing, from the flinching of the horse, or the dead sound, or the peculiar resistance that may be noticed in the driving of the nail. We would plead the cause of the honest portion of a humble class of men, who discharge this mechanical part of their business with a skill and good fortune scarcely credible; but we resign those to the reproaches and the punishment of the owner of the horse, who too often and with bad policy deny that which accident or, possibly, momentary carelessness, might have occasioned, and the neglect of which is fraught with danger, although the mischief resulting from it might at the time be easily remedied.

When the seat of mischief is ascertained, the sole should be thinned round it, and, especially at the nail-hole, or the puncture, it should be pared to the quick. The escape of some matter will now probably tell the nature of the injury, and remove its consequences. If it be puncture of the sole by some nail, or any similar body, picked up on the road, all that will be necessary is a little to enlarge the opening, and then to place on it a pledget of tow dipped in Friar's balsam, and over that a little common stopping; or, if there be much heat and lameness, a poultice should be applied.

The part of the sole wounded and the depth of the wound will be taken into consideration. It will be seen, by reference to the cut in page 249, that a deep puncture towards the back part of the sole, and penetrating even into the sensible frog, may not be productive of serious consequence. There is no great motion in the part, and there are no tendons or bones in danger. A puncture near the toe may not be followed by much injury. There is little motion in that part of the foot, and the internal sole covering the coffin-bone will soon heal; but a puncture about the centre of the sole may wound the flexor tendon where it is inserted into the coffin-bone, or may even penetrate the joint which unites the navicular-bone with the coffin-bone, or pierce through the tendon into the joint which it forms with the navicular-bone, and a degree of inflammation may ensue, which, if neglected, may be fatal. Many horses have been lost by the smallest puncture of the sole in these dangerous points. All the anatomical skill of the veterinarian should be called into requisition, when he is examining the most trifling wound of the foot.

If the foot has been wounded by the wrong direction of a nail in shoeing, and the sole be well pared out over the part on the first appearance of lameness, little more will be necessary to be done. The opening must be somewhat enlarged, the Friar's balsam applied, and the shoe tacked on, with or without a poultice, according to the degree of lameness or heat, and on the following day all will often be well. It may, however, be prudent to keep the foot stopped for a few days. If the accident has been neglected, and matter begins to be formed, and to be pent up and to press on the neighbouring parts, and the horse evidently suffers extreme pain, and is sometimes scarcely able to put his foot to the ground, and much matter is poured out when the opening is enlarged, further precautions must be adopted. The fact must be recollected that the living and dead horn will never unite, and every portion of the horny sole that has separated from the fleshy sole above must be removed. *The separation must be followed as far as it reaches.* Much of the success of the treatment depends on this. No small strip or edge of separated horn must be suffered to press upon any part of the wound. The exposed fleshy sole must then be touched, but not too severely, with the butyr (chloride) of antimony, some soft and dry tow placed over the part, and the foot stopped, and a poultice placed over all if the inflammation seems to require it. On the following day a thin pellicle of horn will frequently be found over a part or the whole of the wound. This should be, yet very lightly, touched again with the caustic; but if there be an appearance of fungus sprouting from the exposed surface, the application of the butyr must be more severe, and the tow again placed over it, so as to afford considerable yet uniform pressure. Many days do not often elapse before the new horn covers the whole of the wound. In these extensive openings the Friar's balsam will not often be successful, but the cure must be effected by the judicious and never too severe use of the caustic. Bleeding at the toe, and physic, will be resorted to as useful auxiliaries when much inflammation arises.

In searching the foot to ascertain the existence of prick, there is often something very censurable in the carelessness with which the horn is cut away between the bottom of the crust and the sole, so as to leave little or no hold for the nails, while some months must elapse before the horn will grow down sufficiently far for the shoe to be securely fastened.

When a free opening has been made below, and matter has not broken out at the coronet, it will rarely be necessary to remove any portion of the horn at the quarters, although we may be able to ascertain by the use of the probe that the separation of the crust extends for a considerable space above the sole.

CORNS.

In the angle between the bars *c*, p. 283, and the quarters, the horn of the sole has sometimes a red appearance, and is more spongy and softer than at any other part. The horse flinches when this portion of the horn is pressed upon, and there is occasional or permanent lameness. This disease of the foot is termed CORNS: bearing this resemblance to the corn of the human being, that it is produced by pressure, and is a cause of lameness, but differing from it in that the horn, answering to the skin of the human foot, is thin and weak, instead of being thickened and hardened. When it is neglected, so much inflammation is produced in that part of the sensible sole, that suppuration follows, and to that, quittor, and the matter either undermines the horny sole, or is discharged at the coronet.

The cause is pressure on the sole at that part, by the irritation of which a small quantity of blood is extravasated. The horn is secreted in a less quantity, and of a more spongy nature, and this extravasated blood becomes inclosed in it.

This pressure is produced in various ways. When the foot becomes contracted, the part of the sole inclosed between the external crust which is wiring in, and the bars which are opposing that contraction (see cut, p. 283), is squeezed as it were in a vice, and becomes inflamed; hence it is rare to see a contracted foot without corns. When the shoe is suffered to remain on too long, it becomes imbedded in the heel of the foot: the external crust grows down on the outside of it, and the bearing is thrown on this angular portion of the sole. No part of the sole can bear continued pressure, and inflammation and corns are the result. From the length of wear the shoe sometimes becomes loosened at the heels, and gravel insinuates itself between the shoe and the crust, and accumulates in this angle, and even eats into it and wounds it. The bars are too frequently cut away, and then the heel of the shoe must be bevelled inward, in order to answer to this absurd and injurious shaping of the foot; and by this slanting direction of the heel of the shoe inward, an unnatural disposition to contraction is given, and the sole must suffer in two ways, in being pressed upon by the shoe, and being squeezed between the outer crust and the external portion of the bar. The shoe is often made unnecessarily narrow at the heels, by which this angle, seemingly less disposed to bear pressure than any other part of the foot, is exposed to accidental bruises. If, in the paring out of the foot, the smith should leave the bars prominent, he too frequently neglects to pare away the horn in the angle between the bars and the external crust; or if he cuts away the bars, he scarcely touches the horn at this point; and thus, before the horse has been shod a fortnight, the shoe rests on this angle, and produces corns. The use of a shoe for the fore feet, thickened at the heels, is, and especially in weak feet, a source of corns, from the undue bearing there is on the heels, and the concussion to which they are subject.

The unshod colt rarely has corns. The heels have their natural power of expansion, and the sensible sole at this part can scarcely be imprisoned, while the projection of the heel of the crust and the bar is a sufficient defence from external injury. Corns seem to be, to a certain degree, the almost inevitable consequence of shoeing, which, by limiting, or in a manner destroying, the expansibility of the foot, must, when the sole attempts to descend, or the coffin bone has a backward and downward direction (see cut, p. 249), imprison and injure this portion of the sole; and this evil consequence is increased when the shoe is badly formed, or kept on too long, or when the paring is omitted or injudiciously extended to the bars. By this unnatural pressure of the sole, blood is thrown out, and enters into the pores of the soft and diseased horn which is then secreted: therefore we judge of the existence and the extent of the corn by the colour and softness of the horn at this place.

The cure is difficult; for as all shoeing has some tendency to produce pressure here, it is difficult to get rid of the habit of throwing out this diseased horn when it is once contracted.

The first thing to be done is well to pare out the angle between the crust and the bars. Two objects are answered by this; the extent of the disease will be ascertained, and one cause of it removed. A very small drawing knife must be used for this purpose. The corn must be pared out to the very bottom, taking care not to wound the sole. It will then be discovered whether there be any effusion of blood or matter underneath. If this be suspected, an opening must be made through the horn, the matter evacuated, the separated horn taken away, the course and extent of the sinuses explored, and the treatment recommended for quittor adopted. Should there be no collection of fluid, the butyr of antimony should be applied over the whole extent of the corn, after the horn has been thinned as closely as possible. The object of this is to stimulate the sole to throw out more healthy horn. In bad cases a bar-shoe may be put on, so chambered, that there shall be no pressure on the diseased part. This may be worn for one or two shoeings, but not constantly, for there are few frogs that would bear the constant pressure of the bar-shoe; and the want of the pressure on the heel, generally occasioned by their use, would produce a softened and bulbous state of the heels, which would of itself be an inevitable source of lameness.

In the great majority of cases the corn is either confined to the inner quarter of the foot, or crust. That this should be the case may be easily imagined, from what we have said of contraction being most frequent in the inner quarter. The shoe, unfettered on the inner side, may, in corn on that side, be applied with great benefit if the country be not too heavy, or the pace required from the horse too great.

Next is to be considered the cause of the corn, which a careful examination of the foot and the shoe will easily discover. The cause being ascertained, the effect may, to a great extent, be afterwards removed. Turning out to grass, after the horn is a little grown, first with a bar-shoe, and afterwards with the shoe fettered on one side, or with tips, will often be serviceable. A horse that has once had corns to any considerable extent should, at every shoeing, have the seat of corn well pared out, and the butyr of antimony applied. The *seated* shoe (hereafter to be described) should be used, with a web sufficiently thick to cover the place of corn, and extending as far back as it can be made to do without injury to the frog.

Low weak heels should be rarely touched with the knife, or anything more be done to them than lightly to rasp them, to give them a level surface. The inner heel should be particularly spared. Corns are seldom found in the hind feet, because the heels are stronger and the feet are not exposed to so much concussion; and when they are found there they are rarely or never productive of lameness.

THRUSH

Is a discharge of offensive matter from the cleft of the frog. It is inflammation of the lower surface of the sensible frog, and during which pus is secreted together with, or instead of horn. When the frog is in its sound state the cleft sinks but a little way into it; but when it becomes contracted or otherwise diseased, the cleft extends in length, and penetrates even to the sensible horn within, and through this unnaturally deepened fissure the thrushy discharge proceeds. It is caused by anything that interferes with the healthy structure and action of the frog. We find it in the hinder feet oftener and worse than in the fore, because in our stable management the hinder feet are too much exposed to the pernicious effect of the dung and the urine, moistening, or as it were macerating, and at the same time irritating them. The distance of the hinder feet from the centre of the circulation would, as in the case of grease, more expose them to accumulations of fluid and discharges of this kind. In the fore feet thrushes are usually connected with contraction. We have stated that they are both the cause and the effect of contraction. The pressure on the frog from the wiring in of the heels will produce pain and inflammation, and the inflammation, by the increased heat and suspended function of the part, will dispose to contraction. Horses of all ages, and in almost all situations, are subject to thrush. The unshod colt is frequently thus diseased.

Thrushes are not always accompanied by lameness. In a great many cases the appearance of the foot is scarcely, or not at all altered, and the disease can only be detected by close examination, or the peculiar smell of the discharge. The frog may not appear to be rendered in the slightest degree tender by it, and therefore the horse may not be considered by many as unsound. Every disease, however, should be considered as legal unsoundness, and especially a disease which, although not attended with present detriment, must not be neglected, for it would eventually injure and lame the horse. All other things being right, a horse should not be rejected because he has a slight thrush, for if the shape of the hoof be not altered, experience tells us that the thrush is easily removed; yet if the thrush be not soon removed, it will alter the shape of the foot and the action of the horse, and become manifest unsoundness. The progress of a neglected thrush, although sometimes slow, is sure. The frog begins to contract in size, it becomes rough, ragged, brittle, tender. The discharge is more copious and more offensive—the horn gradually disappears—a mass of hardened mucus usurps its place—this easily peels off, and the sensible frog remains exposed—the horse cannot bear it to be touched—fungous granulations spring from it—they spread around—the sole becomes underrun, and canker steals over the greater part of the foot.

There are few errors more common or more dangerous, than that the existence of thrush is a matter of little consequence, or even, as some suppose, a benefit to the horse,—a discharge for superabundant humours,—and that it should not be dried up too quickly, and in some cases not dried up at all. If a young colt, fat and full of blood, has a bad thrush, with much discharge, it may be prudent to accompany the attempt at cure by a dose of physic or a course of diuretics; a few diuretics may not be injurious when we are endeavouring to dry up thrush in older horses: but disease can scarcely be attacked too soon or subdued too rapidly, and especially a disease which steals on so insidiously, and has such fatal consequences in its train. If the heels once begin to contract through the baneful effect of thrush, it will with difficulty, or not at all, be afterwards removed.

There are many recipes to stop a running thrush. Almost every application of an astringent but not too caustic nature will have the effect. The common Ægyptiacum (vinegar boiled with honey and verdigrease) is a very good liniment; but the most effectual and the safest, drying up the discharge speedily, but not suddenly, is a paste composed of two ounces of blue and one of white vitriol powdered as finely as possible, and rubbed down with one pound of tar and two of lard. A pledget of tow covered with it should be introduced as deeply as possible, yet without force, into the cleft of the frog every night, and removed in the morning before the horse goes to work. Attention should at the same time, as in other diseases of the foot, be paid to the apparent cause of the complaint, and that cause should be carefully obviated or removed. Before the application of the paste, the frog should be examined, and every loose part of the horn or hardened discharge removed; and if much of the frog be then exposed, a larger and wider piece of tow covered with the paste may be placed over it, in addition to the pledget introduced into the cleft of the frog. It will be necessary to preserve the frog moist while the cure is in progress, and this may be done by filling the feet with tow covered by common stopping, or using the felt pad, likewise covered with it. Turning out would be prejudicial rather than of benefit to thrushy feet, except the dressing be continued, and the feet defended from moisture.

CANKER

Is a separation of the horn from the sensible part of the foot, and the sprouting of fungous matter instead of it, and occupying a portion of, or even the whole of the sole and frog. It is the occasional consequence of bruise, puncture, corn, quittor, and thrush, and is extremely difficult to cure. It is more frequently the consequence of neglected thrush than of any other disease of the foot. It is oftenest found in, and is almost peculiar to the heavy breed of cart horse, resulting partly from constitutional predisposition. Horses with white legs and thick skins, and much hair upon their legs,—the very character of many of our dray horses,—are subject to canker, especially if they have had an attack of grease, or their heels are habitually thick and greasy. The disposition to canker is certainly hereditary. The dray horse likewise has this disadvantage, that in order to give him *foot-hold*, it is necessary to raise the heels of the hinder feet so high, that all pressure on the frog is taken away, its functions are destroyed, and it is rendered liable to disease. Canker, however, arises more from the peculiar injury to which the feet of these horses are subject from the enormous shoes with which they are covered, the bulk of the nails with which these shoes are necessarily fastened to the foot, and the strain of the foot, in the violent although short exertion in moving heavy weights; but most of all from the neglect of the feet, and the filthiness of the stable in these establishments. Although canker is a disease most difficult to remove, it is easily prevented. Attention to the punctures to which these heavy horses, with their clubbed feet and brittle hoofs, are more than any others subject in shoeing, and to the bruises and treads on the coronet, to which with their awkwardness and weight they are so liable, and the greasy heels which a very slight degree of negligence will produce in them, and to the stopping of the thrushes, which are so apt in them to run on to the separation of the horn from the sensible frog, will most materially lessen the number of cankered feet. Where this disease often occurs, the owner of the team may be well assured that there is gross mismanagement either in himself, or his horsekeeper, or smith, or surgeon, and it will rarely be a difficult matter to detect the precise nature of that mismanagement.

The cure of canker is the business of the veterinary surgeon, and a most harassing and tedious business it is. The principles on which he proceeds are first of all to remove the extraneous fungous growth, and here probably he will call in the aid both of the knife and the caustic, or the cautery; he will cut away every portion of horn which is in the slightest degree separated from the sensible parts beneath. He will next endeavour to discourage the growth of fresh fungus, and to bring the foot into that state in which it will again secrete healthy horn: here he will remember that he has to do with the *surface* of the foot; that this is a disease of the surface only, and that there will be no necessity for those deeply-corroding and torturing caustics which will eat to the very bone. A slight and daily application of the chloride of antimony, and that not where the new horn is forming, but only on the surface which continues to be diseased, and accompanied by as firm but equal pressure as can be made—and the careful avoidance of the slightest degree of moisture—the horse being exercised or worked in the mill, or wherever the foot will not be exposed to wet—and that exercise adopted as early as possible, and even from the beginning if the disease is confined to the sole and frog—these means will succeed if the disease is capable of cure. Humanity, perhaps, will dictate, that, considering the long process of cure in a cankered foot, and the daily torture of the caustic, and the suffering which would otherwise result from so large or exposed a surface, the nerves of the leg should be divided to take away the sense of pain; but then especial care must be taken that the horse is placed in such a situation, and exposed to such work, that, being insensible to pain, he may not injuriously batter and bruise diseased parts.

Medicine is not of much in the avail in the cure of canker. It is a mere local disease; or the only cause of fear is, that so great a determination of blood to the extremities, having existed during the long progress of the cure, it may in some degree continue, and produce injury in another form. Grease has occasionally followed canker. They have, although rarely, been known to alternate. When one has become better, the other has appeared, and that for a considerable period. It may, therefore, be prudent, when the cure of a cankered foot is nearly effected, to subject the horse to a course of alteratives or diuretics.

OSSIFICATION OF THE CARTILAGES.

We have spoken (page 288) of the side cartilages of the foot, occupying (see cut, page 254) a considerable portion of the external side and back part of the foot. They are designed to preserve the expansion of the upper part of the foot, and to preserve it, when that of the lower part is limited or destroyed by shoeing. These cartilages are subject to inflammation, and the result of that inflammation is, that the cartilages are absorbed, and bone is substituted in their stead. This ossification of the cartilages frequently accompanies ringbone, but it may exist without any affection of the pastern joint. It is oftenest found in horses of heavy draught. It arises not so much from concussion, as from a species of sprain, for the pace of the horse is slow. The cause, indeed, is not well understood, but of the effect we have too numerous instances. Very few heavy draught horses arrive at old age without this change of structure.

In the healthy state of the foot, these cartilages will readily yield to the pressure of the fingers on the coronet over the quarters, but, by degrees, the resistance becomes greater, and at length bone is formed, and the parts yield no more. No evident inflammation of the foot, or great, or perhaps even perceptible lameness accompanies this change: a mere slight degree of stiffness may have been observed, which, in a horse of more rapid pace, would have been lameness. Even when the change is completed, there is not in many cases any thing more than a slight increase of stiffness, little or not at all interfering with the usefulness of the horse. When this altered structure appears in the lighter horse, the lameness is more decided, and means should be taken to arrest the progress of the change: these are blisters or firing; but, after these parts have become bony, no operation will restore the cartilage.

Connected with ringbone the lameness may be very great. This has been spoken of in page 254.

WEAKNESS OF THE FOOT.

This is more accurately a bad formation, than a disease; often, indeed, the result of disease, but in many instances the natural construction of the foot. The term *weak foot* is familiar to every horseman, and the consequence is too severely felt by all who have to do with horses. In the slanting of the crust from the coronet to the toe, a less angle is almost invariably formed, amounting probably to not more than forty instead of forty-five degrees; and after the horse has been worked for one or two years the line is not straight, but a little indented or hollow, midway between the coronet and the toe. We have described this as the accompaniment of pumiced feet, but it is often seen in weak feet, which, although they might become pumiced by severity of work, do not otherwise have the sole convex. The crust is not only less oblique than it ought to be, but it has not the smooth, even appearance of the good foot. The surface is sometimes irregularly roughened, but it is much oftener roughened in circles or rings. The form of the crust likewise presents too much the appearance of a cone; the bottom of the foot is unnaturally wide in proportion to the coronet; and the whole of the foot is generally, but not always, larger than it should be.

When the foot is lifted, it will often present a round and circular appearance, with a fullness of frog, that would mislead the inexperienced, and indeed be considered as almost the perfection of structure; but, being examined more closely, many glaring defects will be seen. The sole is flat, and the smith finds that it will bear little or no paring. The bars are small in size. They are not cut away by the smith, but they can be scarcely said to have any existence; the heels are low, so low that the very coronet seems almost to touch the ground; and the crust, if examined, seems scarcely thick enough to hold the nails. Horses with these feet can never stand much work. They will be subject to corns, to bruises of the sole, to convexity of the sole, to punctures in nailing, to breaking away of the crust, to inflammation of the foot, and to sprain and injury of the pastern, and the fetlock, and the flexor tendon. These feet admit of little improvement. Shoeing as seldom as may be, and with a light, yet wide concave web; little or no paring at the time of shoeing, with as little violent work as possible, and especially on rough roads, may protract for a long period the evil day, but he who buys a horse with these feet will sooner or later have cause to repent his bargain.

Chapter XVII.

ON SHOEING.

The period when the shoe began to be nailed to the foot of the horse is uncertain. William the Norman introduced it into our country.

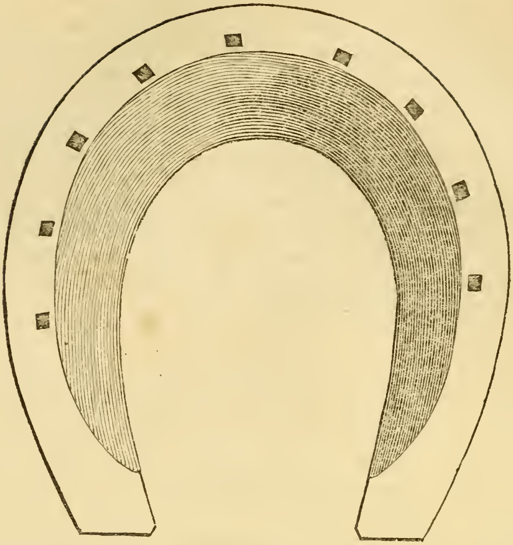
We have seen, in the progress of our inquiry, that while it affords to the foot of the horse that defence which seems now to be necessary against the destructive effects of our artificial and flinty roads, it has entailed on the animal some evils. It has limited or destroyed the beautiful expansibility of the lower part of the foot; it has led to contraction, although that contraction has not always been accompanied by lameness; in the most careful fixing of the best shoe, and in the careless manufacture and setting on of the bad one, much injury has often been done to the horse; yet, as we have already stated, to nothing like the extent which some have fancied or feared.

THE CONCAVE-SEATED SHOE.

The proper form and construction of the shoe is a subject deserving of very serious inquiry, for it is most important to ascertain the kind of shoe that will do the least mischief to the feet. We subjoin a cut of that which we strongly recommend for general purposes. It is in use in many of our best forges, and is gradually superseding the flat and the simple concave shoe. The following cut exhibits the near fore shoe.

It presents a perfectly flat surface to the ground, to give as many points of bearing as possible, except that, round the outer edge, there is a groove or *fuller*, in which the nail holes are punched, so that, sinking into the fuller, their heads project but a little way, and are soon worn down level with the shoe. The ground surface of the common shoe used in the country is somewhat convex, and the inward rim of the shoe comes first on the ground: the consequence of this is, that the weight, instead of being borne fairly on the crust, is supported by the nails and the clenches, which must be injurious to the crust, and often chip and tear it.

The web of the shoe is of the same thickness throughout, from the toe to the heel; and it is sufficiently wide to guard the sole from bruises, and



as wide at the heel as the frog will permit, in order to cover the seat of corn.

On the foot side it is *seated*. The outer part of it is accurately flat, and of the width of the crust, and designed to support the crust, and the crust only, for it has already been proved that by the crust alone, or rather by the union between the numerous little plates proceeding from the crust and the covering of the coffin-bone, the whole weight of the horse is supported. Towards the heel this flattened part is wider and occupies the whole breadth of the web, to support (see page 283) the heel of the crust and its reflected part the bar: thus, while it defends the horn included within this angle from injury, it gives that equal pressure upon the bar and the crust, which is the best preventive against corn, and a powerful obstacle to contraction.

It is fastened to the foot by nine nails, five on the outside, and four on the inner side of the shoe; those on the outside extending a little farther down towards the heel, because the outside heel is thicker and stronger, and there is more nail-hold; the last nail on the inner quarter being farther from the heel on account of the weakness of that quarter. For feet not too large, and where moderate work only is required from the horse, four nails on the outside, and three on the inside, will be sufficient; and the last nail being far from the heels, will allow more expansion there.

The inside part of the web is bevelled off, or rendered concave, that it may not press upon the sole. Notwithstanding our iron fetter, the sole does, although to a very inconsiderable extent, descend when the foot of the horse is put on the ground. It is unable to bear constant or even occasional pressure, and if it came in contact with the shoe, the sensible sole, between the horny sole and the coffin-bone, would be bruised, and lameness would ensue. Many of our horses, from too early and undue work, have the natural concave sole flattened, and the disposition to descend and the degree of descent are thereby increased. The concave shoe prevents, even in this case, the possibility of injury, because the sole can never descend in the degree in which the shoe is bevelled. A shoe bevelled still further is necessary to protect the projecting or pumiced foot.

While the horse is travelling, dirt and gravel are apt to insinuate themselves between the web of the shoe and the sole. If the shoe were flat they would be easily retained there, and would bruise the sole and be productive of injury; but when the shoe is thus bevelled off, it is scarcely possible for them to remain. They must be shaken out every time the foot comes in contact with the ground.

The web of the shoe is likewise of that thickness, that when the foot is properly pared, the prominent part of the frog shall lie just within and above its ground surface, so that in the descent of the sole the frog shall come sufficiently on the ground, to enable it to act as a wedge, and to expand the quarters, while it is defended from the wear and injury it would receive if it came on the ground with the first and full shock of the weight.

The nail holes are, on the ground side, placed as near the outer edge of the shoe as they can safely be, and brought out near the inner edge of the seating. The nails thus take a direction inward, resembling the direction of the crust itself, and take firmer hold; while the strain upon them in the common shoe is altogether prevented; and, the weight of the horse being thrown on a flat surface, contraction is not so likely to be produced.

The smith sometimes objects to the use of this shoe on account of its not being so easily formed as one composed of a bar of iron, either flat or a little bevelled. It likewise occupies more time in the forming; but these objections would vanish, when the owner of the horse declared that he would have him shod elsewhere; or when he consented, as in justice he should, to pay somewhat more for a shoe that required better workmanship and longer time in the construction.

THE PREPARATION OF THE FOOT.

We will suppose that the horse is sent to the forge to be shod. If the master would occasionally accompany him there, he would find it much to his advantage. The old shoe must be first taken off. We have something to observe even on this. It was retained on the foot by the ends of the nails being twisted off, turned down, and clenched. These clenches should be first raised, which the smith seldom takes the trouble thoroughly to do: but after going carelessly round the crust and raising one or two of the clenches, he takes hold first of one heel of the shoe, and then of the other, and by a violent wrench separates them from the foot, and by a third wrench, applied to the middle of the shoe, he tears it off. By this means he must enlarge every nail hole, and weaken the future hold, and sometimes tear off portions of the crust, and otherwise injure the foot. The horse generally shews by his flinching that he suffers by the violence with which this preliminary operation is performed. The clenches should always be raised or filed off; and where the foot is tender, or the horse is to be examined for lameness, each nail should be partly punched out. Many a stub is left in the crust, the source of future annoyance, when this unnecessary violence is used.

The shoe having been removed, the smith proceeds to rasp the edges of the crust. Let not the stander-by object to the apparent violence which he uses, or fear that the foot will suffer. It is the only means he has, with safety to his instruments, to detect whether any stubs remain in the nail-holes; and it is the most convenient method of removing that portion of the crust into which dirt and gravel have insinuated themselves.

Next comes the important process of paring out, with regard to which it is almost impossible to lay down any specific rules. This, however, we can say with confidence, that more injury has been done by the neglect of paring, than by carrying it to too great an extent. The act of paring is a work of much more labour than the proprietor of the horse often imagines; the smith, except he be overlooked, will give himself as little trouble about it as he can; and that, which in the unshod foot, would be worn away by contact with the ground, is suffered to accumulate month after month, until the elasticity of the sole is destroyed, and it can no longer descend, and the functions of the foot are impeded, and foundation is laid for corn, and contraction, and navicular disease, and inflammation. That portion of horn should be left on the sole, which will defend the internal parts from being bruised, and yet suffer the external sole to descend. How is this to be measured? The strong pressure of the thumb of the smith will be the best guide. The buttress, that most destructive of all instruments, being banished from the respectable forge, the smith sets to work with his drawing knife, and he removes the growth of horn, until the sole will yield, although in the slightest possible degree, to the very strong pressure of his thumb. The proper thickness of horn will then remain.

If the foot has been previously neglected, and the horn is become very hard, the owner must not object if the smith resorts to some means to soften it a little; and if he takes one of his flat irons, and having heated it, draws it over the sole, and keep it a little while in contact with it. When the sole is thick, this rude and apparently barbarous method can do no harm, but it should never be permitted with the sole that is regularly pared out.

The quantity of horn to be removed in order to leave the proper degree of thickness will vary with different feet. From the strong foot a great deal must be taken. From the concave foot the horn may be removed until the sole will yield to a moderate pressure. From the flat foot little need be pared; while the pumiced foot will spare nothing but the ragged parts.

The paring being nearly completed, the knife and the rasp of the smith must be a little watched, or he will reduce the crust to a level with the sole, and thus endanger the bruising of the sole by its pressure on the edge of the seating. The crust should be reduced to a perfect level, all round, but left a little higher than the sole.

The heels will require very considerable attention. From the stress which is thrown on the inner heel, and from the weakness of the quarter there, it usually wears considerably faster than the outer one; and, if an equal portion of horn were pared from it, it would be left lower than the outer heel. The smith should, therefore, accommodate his paring to the comparative wear of the heels, and be very careful to leave them precisely level.

If the reader will recollect what we have said of the intention and action of the bars, he will readily perceive that the smith should be checked in his almost universal fondness for opening the heels, or, more truly, removing that which is the main impediment to contraction. That portion of the heels between the inflection of the bar and the frog should scarcely be touched, at least nothing but the ragged and detached parts should be cut away. The foot may not look so pretty, but it will last longer without contraction.

The bar likewise should be left fully prominent, not only at its first inflection, but as it runs down the side of the frog. The heel of our shoe is designed to rest partly on the heel of the foot, and partly on the bar, for reasons that have been already stated. If the bar is weak, the growth of it should be encouraged, and it should be scarcely touched at the shoeing until it has attained a level with the crust. We recall to the recollection of our readers, the observation which we have made in page 283, that the destruction of the bars not only leads to contraction by removing a powerful impediment to it, but by adding a still more powerful cause in the slanting direction which is given to the bearing at the heels, when the bar does not contribute to the support of the weight.

It will also be apparent that the horn between the crust and the bar should be carefully pared out. Every horseman has observed the relief which is given to the animal lame with corns when this angle is well thinned; a relief, however, which is but temporary, for when the horn grows again and the shoe presses upon it, the torture of the animal is renewed.

The degree of paring to which the frog must be subjected will depend on its prominence, and on the shape of the foot. The principle has already been stated, that it must be left so far projecting and prominent, that it shall be just within and above the lower surface of the shoe, it will then descend with the sole, sufficiently to discharge the functions which we have attributed to it. If it be lower, it will be bruised and injured; if it be higher, it cannot come in contact with the ground, and thus be enabled to do its duty. The ragged parts must be removed, and especially those occasioned by thrush, but the degree of paring must depend entirely on this principle.

It appears, then, that the office of the smith requires some skill and judgment in order to be properly discharged; and the horse proprietor will find it his interest occasionally to visit the forge and complain of the careless, or idle, or obstinate, and reward, by some trifling gratuity, the expert and diligent. He should likewise remember that a great deal more depends on the paring out of the foot than on the construction of the shoe; that few shoes, except they press upon the sole, or are made outrageously bad, will lame the horse; but that he may be very easily lamed from ignorant and improper paring out of the foot.

THE PUTTING ON OF THE SHOE.

The foot being thus prepared, the smith looks about for a shoe. He should select one that as nearly as possible fits the foot, or may be altered to the foot. He will sometimes care little about this, for he can easily alter the foot to the shoe. The toe-knife is a very convenient instrument for him, and plenty of horn can be struck off with it, or removed by the rasp, to make the foot as small as the shoe; while he cares little, although by this destructive method the crust is materially thinned where it should receive the nail, and the danger of puncture is increased, and the danger of pressure upon the sole is increased, and a foot so artificially diminished in size will soon grow over the shoe, to the hazard of considerable or permanent lameness.

While choosing the shoe we must once more refer to the shape of our pattern shoe; the web is of equal thickness from toe to heel. A shoe, thinner at the heel than at the toe, by letting down the heel too low, is apt to produce sprain of the flexor tendon, and a shoe thicker at the heels than at the toe is fit only to elevate the frog, to the destruction of its function, and to its own certain disease, and also to press upon and to batter and to bruise that part of the foot which is soonest and most destructively injured.

CALKINS.

It is expedient not only that the foot and ground surface of the shoe should be most accurately level, but that the crust should be exactly smoothed and fitted to the shoe. Much skill and time are necessary to do this perfectly with the drawing knife. The smith has adopted a method of more quickly and more accurately adapting the shoe to the foot. He pares the crust as level as he can, and then he takes the shoe, at a heat something below a red heat, and applies it to the foot, and detects any little elevations by the deeper colour of the burned horn. This practice has been much inveighed against; but it is the abuse and not the use of the thing which is to be condemned. If the shoe be not too hot, nor held too long on the foot, an accuracy of adjustment is thus obtained, which the knife would be long in producing, or would not produce at all, If, however, the shoe is made to burn its way to its seat with little or no previous preparation of the foot, the heat must be injurious both to the sensible and insensible parts of the foot.

The heels of the shoe should be examined as to their proper width. Whatever be the custom of shoeing the horses of dealers, and the too prevalent practice in the metropolis, of giving the foot an open appearance, although the back part of it is thereby exposed to injury, nothing is more certain, than that in the horse for work, the heels, and particularly the seat of corn, can scarcely be too well covered. Part of the shoe projecting outward can be of no possible good, but rather an occasional source of mischief, and especially in a heavy country. A shoe, the web of which projects inward as far as it can, without touching the frog, affords protection to the angle between the bars and the crust.

Of the manner of attaching the shoe to the foot the owner can scarcely be a competent judge; he can only take care that the shoe itself shall not be heavier than the work requires—that for work a little hard the shoe shall still be light, with a bit of steel welded into the toe—that the nails shall be as small, and as few, and as far from the heels, as may be consistent with the security of the shoe; and that, for light work at least, the shoe shall not be driven on so closely and firmly as is often done, nor the points of the nails be brought out so high up as is generally practised.

There are few cases in which the use of calkins (a turning up and elevation of the heel) can be admissible in the fore-feet, except in frosty weather, to prevent the slipping of the feet. If, however, calkins are used, let them be placed on both feet. If the outer heel only be raised with the calkin, as is too often the case, the weight cannot be thrown evenly on the foot, and undue straining and injury of some part of the foot or of the leg must be the necessary consequences. Few things deserve more the attention of the horseman than this most absurd and injurious of all the practices of the forge One quarter of an hour's walking, with one side of the shoe or boot raised considerably above the other, will painfully convince us of what the horse must suffer from this too common method of shoeing. We cannot excuse it even in the hunting shoe. If the horse be ridden far to cover, or galloped over much hard and flinty ground, he will inevitably suffer from this unequal distribution of the weight. If the calkin be put on the outer heel to prevent the horse from slipping, either the horn of that heel should be lowered to a corresponding degree, or the other heel of the shoe should be raised to the same level by a gradual thickening. Of the use of calkins in the hinder foot, we shall presently speak.

CLIPS.

These are portions of the upper edge of the shoe, hammered out, and turned up so as to embrace the lower part of the crust, and which is usually pared out a little to receive the clip. They are very useful, as more securely attaching the shoe to the foot, and relieving the crust from that stress upon the nails which would otherwise be injurious. A clip at the toe is almost necessary in every draught horse, and absolutely so in the horse of heavy draught, to prevent the shoe from being loosened or torn off by the stress which is thrown upon the toe in the act of drawing. A clip on the outside of each shoe at the beginning of the quarters will give security to it. Clips are likewise necessary on the shoes of all heavy horses, and of all others who are disposed to stamp, or violently paw with their feet, and thus incur the danger of displacing the shoe; but they are evils, in that they press upon the crust as it grows down, and should only be used when circumstances absolutely require them.

THE HINDER SHOE.

In forming the *hinder* shoes it should be remembered that the hind limbs are the principal instruments in progression, and that in every act of progression, except the walk, the toe is the point on which the whole frame of the animal turns, and from which it is propelled. This part, then, should be strengthened as much as possible; and, therefore, the hinder shoes are made broader at the toe than the fore ones, and the toe of the foot, which is naturally broader than that of the fore-foot, is still further widened by rasping. Another good effect is produced by this, that the hinder foot being shortened there is less danger of *overreaching* or *forging*, and especially if the shoe be wider on the foot surface than on the ground one; and thus the shoe is made to slope inward, and is a little within the toe of the crust.

The shape of the hinder foot is somewhat different from that of the fore foot; it is straighter in the quarters, and the shoe must have the same shape. For carriage and draught horses generally, calkins may be put on the heels, because the animal will be thus enabled to dig his toe more firmly into the ground, and urge himself forward, and throw his weight into the collar with greater advantage. But the calkins must not be too high, and they must be of an equal height on each heel; otherwise, as has been stated with regard to the fore feet, the weight will not be fairly distributed over the foot, and some part of the foot or of the leg will materially suffer. The nails in the hinder shoe may be placed nearer to the heel than in the fore shoe, because, from the comparative little weight and concussion thrown on the hinder feet, there is not so much danger of contraction.

DIFFERENT KINDS OF SHOES.

The shoe will vary in substance and weight with the kind of foot, and the nature of the work. A weak foot should never wear a heavy shoe, nor any foot a shoe that will last longer than a month. Here, perhaps, we may be permitted to caution the horse-proprietor against having his cattle shod too much by contract, unless he binds down his farrier or surgeon to remove the shoes once at least in every month; for if the contractor, by a heavy shoe, and a little steel, can cause five or six weeks to intervene between the shoeings, he will do so, although the feet of the horse must necessarily suffer. The shoe should never be heavier than the work requires. An ounce or two in the weight of the shoe will sadly tell before the end of a hard day's work. This is acknowledged in the hunter's shoe, which is narrower and lighter than that of the hackney with even smaller feet than the hunter ; and it is more decidedly acknowledged in the racer, who wears a shoe only sufficiently thick to prevent it from bending when used.

THE HUNTING SHOE.

The hunter's shoe is different from that of the hackney in shape as well as weight. It is not so much bevelled off as the common concave seated shoe. Sufficient space alone is left for the introduction of a picker between the shoe and the sole, otherwise, in going over heavy ground, the clay will get in, and by its tenacity loosen, and even tear off the shoe. The heels likewise are somewhat shorter, that they may not be torn off by the toe of the hind-feet when galloping fast, and the outer heel is frequently and injudiciously turned up to prevent slipping. The reader will remember what we have just said of this. If calkins are necessary, let, at least, both heels have an equal bearing.

THE BAR-SHOE.

A bar-shoe is a very useful contrivance. It is the continuation of the common shoe round the heels, and by means of it the pressure may be taken off some tender part of the foot and thrown on another which is better able to bear it, or more widely and equally diffused over the whole foot. It is principally resorted to in cases of corn, the seat of which it perfectly covers—in pumiced feet, the soles of which may be thus elevated above the ground and secured from pressure,—in sand-crack, when the pressure may be removed from the fissure and thrown on either side of it—in thrushes, when the frog is tender, or is become cankered, and requires to be frequently dressed, and the dressing can by this means alone be retained. In these cases the bar-shoe is an excellent contrivance, if worn only for one or two shoeings, or as long as the disease requires it to be worn, but it must be left off as soon as it can be dispensed with. If it be used for the protection of a diseased foot, however it may be chambered and laid off the frog, it will soon be flattened down upon it; or if the pressure of it be thrown on the frog to relieve the sand-crack or the corn, that frog must be very strong and healthy which can long bear the great and continued pressure. More mischief is often produced in the frog than previously existed in the part which was relieved. It will be plain that in the use of the bar-shoe for corn or sand-crack, the crust and the frog should be precisely on a level, and the bar should be the widest part of the shoe, to afford as extended bearing as possible on the frog, and therefore less likely to be injurious. Bar-shoes are evidently not safe in frosty weather; they are never safe when much speed is required from the horse, and they are apt to be wrenched off in a heavy, clayey country.

TIPS.

Tips are short shoes, reaching only half round the foot, and worn while the horse is at grass to prevent the crust being torn by the occasional hardness of the ground, or by the pawing of the animal; and the quarters at the same time being free, the foot disposed to contract has a chance of expanding and regaining its natural shape.

THE EXPANDING SHOE.

Our subject would not be complete if we did not describe the supposed expanding shoe. It is either seated or concave like the common shoe, with a joint at the toe, by which the natural expansion of the foot is said to be permitted, and the injurious consequences of shoeing prevented. There is, however, this radical defect in the jointed shoe, that the nails occupy the same situation as in the common shoe, and prevent, as do the nails of the common shoe, the gradual expansion of the sides and quarters, and allow only of a hinge-like motion at the toe. This is a most imperfect accommodation of the expansion of the foot to the action of its internal parts, and even this accommodation is afforded in the slightest possible degree, or rather can scarcely be afforded at all. Either the nails fix the sides and quarters as in the common shoe, and then the joint at the toe is useless; or, if that joint merely opens like a hinge, the nail-holes in the shoe can no longer correspond with those in the quarters which are unequally expanding at every point; and, therefore, there will be more stress on the crust at these holes, which will not only enlarge them and destroy the fixed attachment of the shoe to the hoof, but will often tear away portions of the crust. This has, in many cases, been found to be the effect of the jointed shoe: the sides and quarters of the foot have been broken until it has become difficult to find nail-hold. This shoe, to answer the intended purpose, should consist of many joints, running along the sides and quarters, which would make it too complicated and expensive and frail for general use.

While the shoe is to be attached to the foot by nails, we must be content with the concave seated one, taking care to place the nail-holes as far from the heels, and particularly from the inner heel, as the state of the foot and the nature of the work will admit; and where the country is not too heavy nor the work too severe, even omitting the nails on the inner side of the foot. Shoes nailed on the outer side, and at the toe, are more secure than some would imagine, while the inner quarter will be left free, to prevent contraction, or to arrest its progress.

The attempt, however, to lessen the evils produced by shoeing is most praiseworthy; and men like Mr. Bracy Clark deserve the respect and the thanks of the public, although their labours may not be crowned with success. Every contrivance permanently to fix the shoe on the foot *without the use of nails* has failed; but a make-shift shoe has been contrived, and is to be procured at most saddlers, which is easily carried in the pocket, and put on in a minute or two if a shoe is lost in hunting or on the road; and which will remain securely attached to the foot, and prevent injury to it, during a journey of thirty or forty miles.

FELT OR LEATHER SOLES.

When the foot is bruised or inflamed, the concussion or shock produced by the hard contact of the elastic iron on the ground gives the animal much pain, and causes a short and feeling step, or even lameness, and aggravates the injury or disease. A strip of felt or leather is sometimes placed between the seating of the shoe and the crust, which, from its want of elasticity, deadens or materially lessens the vibration or shock, and the horse treads more freely and is evidently relieved. This is a very good contrivance while the inflammation or tenderness of the foot continues, but a very bad practice if constantly adopted. The nails cannot be driven so surely or so securely when this substance is interposed between the shoe and the foot;

the contraction and swelling of the felt or leather from the effect of moisture or dryness will soon render the attachment of the shoe less firm; there will be too much play upon the nails; the nail-holes will enlarge, and the crust will be broken away.

After wounds or extensive bruises of the sole, or where the sole is thin and flat and tender, it is sometimes covered with a piece of leather, fitted to the sole, and nailed on with the shoe. This may be allowed as a temporary defence of the foot; but there is the same objection to its permanent use from the insecurity of fastening, and the strain on the crust, and the frequent chipping of it: and there are these additional inconveniences, that if the hollow between the sole and the leather be filled with stopping and tow, it is exceedingly difficult to introduce them so evenly and accurately as not to produce some partial or injurious pressure—that a few days' work will almost invariably so derange the padding as to produce partial pressure—that the long contact of the sole with stopping of almost every kind will produce, not a healthy, elastic horn, but horn of a scaly, spongy nature—and that if the hollow be not thus filled, gravel and dirt will insinuate themselves, and cause unequal pressure, and eat into and injure the foot.

Chapter XVIII.

OPERATIONS.

These belong more to the veterinary-surgeon than to the proprietor of the horse, but a short account of the manner of conducting the principal ones should not be omitted.

It is frequently necessary to bind the human patient, and in no painful or dangerous operation should this preliminary be omitted. It is more necessary to bind the horse, who is not under the control of reason, and whose struggles may not only be injurious to himself but dangerous to the operator.

The *trevis* is a machine indispensable in every continental forge; even the quietest horses are there put into it to be shod. It is found in many of our country forges, and is occupied by horses that cannot otherwise be shod without manifest danger to the smith. It seldom, however, finds a place in our improved forges, although it would be useful for docking, firing, and many other purposes. The horse is confined within enormous bars of wood, and slung there, but many have been destroyed in their determined resistance to such restraint.

The *side-line* is a very simple and useful method of confining the horse, and places him in sufficient subjection for the operations of docking, nicking, and slight firing. The long line of the *hobbles*, or a common cart-rope with a noose at the end, is fastened on the pastern of one hind-leg. The rope is then brought over the neck and round the withers, and there tied to the portion that comes from the leg. The leg may thus be drawn so far forward, that while the horse evidently cannot kick with that leg, he is disarmed of the other; for he would not have sufficient support under him if he attempted to raise it. Neither can he easily use his fore-legs, or, if he attempts to use them, one of them may be lifted up, when he becomes nearly powerless. If necessary, the aid of the twitch or the barnacles may be resorted to.

For every minor operation, and even for many that are of more importance, this mode of restraint is sufficient; especially if the operator has active and determined assistants: and we confess that we are no friends to the casting of horses if it can possibly be prevented. When both legs are included in the hobble or rope (as in another way of using the side line), the horse may appear to be more secure, but there is greater danger of his falling in his violent struggles during the operation.

For castrating and severe firing the animal must be thrown. The construction of the *hobbles* is well known to every farrier, and almost to every proprietor of horses. We will only say that the safety of the horse and of the operator will require the use of the *improved* hobbles, by which any leg may be released from confinement, and returned to it at pleasure; and, when the operation is ended, the whole of the legs may be set at liberty at once without danger. The method of putting the legs as closely together as possible before the pull,—the necessity of the assistants all pulling together,—and the power, which one man standing at the head and firmly holding the snaffle bridle, and another at the haunch pushing the horse when he is beginning to fall, have in bringing him on the proper side, and on the very spot on which he is intended to lie, need not to be described. This however, is a method of securing the horse to which we repeat that we are not partial, and to which we should not resort except necessity compelled, for in the act of falling, and in the struggles after falling, many accidents have occurred both to the horse and the surgeon.

Among the minor methods of restraint, but sufficient for many purposes, are the *twitch* and the *barnacles.* The former consists of a noose passed through a hole at the end of a strong stick, and in which the muzzle is inclosed. The stick being turned, the muzzle is securely retained, while the horse suffers great pain from the pressure—sufficiently great to render him comparatively inattentive to that which is produced by the operation; at the same time, he is afraid to struggle, for every motion increases the agony caused by the twitch, or the assistant has power to increase it by giving an additional turn to the stick.

The *barnacles* are the handles of the pincers placed over and inclosing the muzzle, and which, being compressed by the assistant, give pain almost equal to that of the twitch. These may appear to be barbarous modes of enforcing submission, but they are absolutely indispensable. In a few instances, the blindfolding of the horse terrifies him into submission; but this is not to be depended upon. The twitch should be resorted to when the least resistance is offered; and when that, as it occasionally does, renders the horse more violent, recourse must be had to the side-line or the hobbles.

In painful examination of the fore-leg or foot while on the ground, the other foot should be held up by an assistant; or, if his aid be required in an operation, the knee may be fully bent, and the pastern tied up to the arm. When the hind-leg is to be examined in the same way, the fore-leg on that side should be held or fastened up.

BLEEDING.

The operation of Bleeding has been already described (p. 179), but we would remind our readers of the necessity, in every case of acute inflammation, of making a large orifice, and abstracting the blood as rapidly as possible, for the constitution will thus be the more speedily and beneficially affected; and also, of the propriety of never determining to take a precise quantity of blood, but of keeping the finger on the artery until the pulse begins to change;—until the strong pulse of fever becomes softer, or the animal is faint, or the oppressed pulse of inflammation of the lungs is rounder and fuller.

In cases of inflammation, and in the hands of a skilful practitioner, bleeding is the sheet-anchor of the veterinarian; yet few things are more to be reprobated than the indiscriminate bleeding of the groom or the farrier.

The change which takes place in the blood after it is drawn from the vein is very diligently noticed by many practitioners, and is certainly deserving of some attention. The blood coagulates soon after it is taken from the vein. The coagulable part is composed of two substances, that which gives colour to the blood, and that in which the red particles float. These, by degrees, separate from each other, and the red particles sink to the bottom. If the coagulation takes place slowly, the red particles have more time to sink through the fluid, and there appears on the top a thick, yellowish, adhesive coat, called the buffy coat. It is supposed that the slowness of coagulation, and the thickness of buffy coat, are indicative of inflammation, and of the degree of inflammation.

In a healthy state of the system, the coagulation is more rapid, the red particles have not time to fall through, and the buffy coat is thin. These appearances are worth observing; but much more dependence is to be placed on the pulse, the change of the pulse, and the symptoms generally. When the horse is exhausted, and the system nearly broken up, the blood will sometimes not coagulate at all, but be of one uniform black colour, and loose texture. When the blood runs down the side of the vessel in which it is received, the coagulation will be very imperfect. When it is drawn in a full stream, it coagulates slowly; when more slowly, or from a smaller orifice, the coagulation is more rapid: therefore, all these extraneous circumstances affecting so much the coagulation and consequent appearance of the blood, the pulse, and the general symptoms, should be the chief objects of regard.

BLISTERING.

Of **Blisters** we have also spoken when treating of the various diseases to which they are applicable. The principle on which they act is, that no two intense inflammations can exist in neighbouring parts, or perhaps in the system, at the same time. Hence we apply some stimulating acrimonious substance to the skin, to excite external inflammation, and to lessen or draw away inflammation in some deeper seated and generally not far distant part. Thus we blister the sides in inflammation of the lungs—the belly in that of the bowels—the legs in that of the cellular substance surrounding the sheaths of the tendons, or the sheaths themselves, and the coronet or the heel in inflammation of the navicular joint.

Blisters have likewise the property of increasing the activity of the neighbouring vessels: thus we blister to bring the tumour of strangles more speedily to a head—we blister to rouse the absorbents to more energetic action, and take away tumours, and callous and even bony substances.

The judgment of the practitioner will decide when the desired effect will be best produced by a sudden and violent action, or by the continuance of one of a milder nature. Inflammation should be met by active blisters; old enlargements and swellings will be most certainly removed by milder stimulants—by the process which farriers call *sweating down.*

There is no better blister ointment or active blister than the Spanish fly, mixed with the proportions of lard and resin already mentioned,

p. 186. The best liquid or sweating blister is an infusion of the fly in turpentine, and that lowered with neat's foot oil according to the degree of activity required.

In preparing the horse for blistering, the hair should be clipped or shaved as closely as possible, and the ointment thoroughly rubbed in. Much fault is often found with the ointment if the blister does not rise, when the real blame should be attributed to the idleness of the operator.

The head of the horse must be tied up for the first two days; except that, when the sides are blistered, the body-clothes may be so contrived as to prevent the horse from nibbling and blemishing the part, or blistering his muzzle. At the expiration of twenty-four hours, a little olive or neat's foot oil may be applied over the blister, which will considerably lessen the pain and supple the part, and prevent cracks in the skin that may be difficult to heal. The oil should be applied morning and night, until the scabs peel off. When they begin to loosen, a lather of soap and water applied with a sponge may hasten their removal, but no violence must be used.

Every particle of litter should be carefully removed from the stall, for the sharp ends of the straw coming in contact with a part rendered so tender and irritable by the blister, will cause very great annoyance to the animal. After the second day the horse may be suffered to lie down; but still the possibility of blemishing himself should be prevented by a *cradle* or wooden necklace, consisting of round strips of wood, strung together, reaching from the lower jaw to the chest, and preventing the horse from sufficiently turning or bending his head, to get at the blistered part.

A blister thus treated will rarely produce the slightest blemish. When the scabs are all removed, the blister may be repeated, if the case should appear to require it, or the horse may be turned out.

In inflammations which threaten life, a blister can scarcely be too active or too extensive. In inflammation of the lungs it should reach over the whole of the sides, and the greater part of the brisket; for, should a portion of the fly be absorbed, and produce *strangury* (inflammation, or spasmodic affection of the neck of the bladder,) even this new irritation may assist in subduing the first and more dangerous one; but in blistering for injuries or diseases of the legs or feet some caution is necessary. When speaking of the treatment of sprain of the back sinews, p. 247, we stated, that ' a blister should never be used while any heat or tenderness remains about the part,' for we should then add to the superficial inflammation, instead of abating the deeper seated one; and enlargements of the limb and ulcerations might follow, which would render the horse perfectly unserviceable. When there is a tendency to grease, a blister is a dangerous thing, and has often aggravated the disease. In winter, the inflammation of the skin produced by blistering is apt to degenerate into grease; therefore, if it should be necessary to blister the horse during that season, great care must be taken that he is not exposed to cold, and, particularly, that a current of cold air does not come upon the legs.

The inhuman practice of blistering *all round*, and perhaps high on the leg at the same time, cannot be too strongly reprobated. Many a valuable horse has been lost through the excessive general irritation which this has produced, or its violent effect on the urinary organs; and this has been particularly the case, when corrosive sublimate has entered into the composition of the blister.

If strangury should appear, the horse should be plentifully supplied with linseed tea, which is thus best prepared—a gallon of boiling water is poured on half a pound of linseed; the infusion suffered to stand till nearly cold, and the clean mucilaginous fluid then poured off. Three-quarters of a pound of Epsom salts should also be given, dissolved in a quart of water, and, after that, a ball every six hours, composed of a scruple of opium, and a drachm of camphor, with linseed meal and treacle.

Half a pound or a pound of good mustard powder, made into a paste with boiling water, and applied hot, will often produce as good a blister as cantharides, with far more swelling. It is a preferable one, where, as in inflammation of the kidneys, the effect of cantharides on the urinary organs is feared. Hartshorn is not so effectual. Tincture of croton makes an active liquid blister.

FIRING.

Whatever seeming cruelty may attend this operation, it is in many cases indispensable. The principle on which we have recourse to it is similar to that which justifies the use of a blister; by producing superficial inflammation we may be enabled to remove a deeper seated one, or we may excite the absorbents to take away any unnatural bony or other tumour: it has also this additional advantage, that, while it raises intenser external inflammation than we can produce by other means, it is the most powerful agent that we have at our disposal. Humanity, however, will dictate, that on account of the inflammation which it excites, and the pain which it inflicts, it should only be had recourse to when milder means have failed, except in those cases in which experience has taught us that milder means rarely succeed.

The part which is to be submitted to the operation is shaved, or the hair is cut from it as closely as possible with the trimming scissors. This is necessary to bring the iron into immediate contact with the skin, and likewise to prevent the smoke that will arise from the burned hair from obscuring the view of the operator. The horse must then be thrown. This is absolutely necessary for the safety both of the operator and the animal. The side line is applied in a shorter time, and so many hands are not wanted to cast the horse; but no person can fire accurately, or with the certainty of not penetrating the skin, except the horse is effectually secured by the hobbles; and although accidents have occurred in the act of throwing, yet many more have resulted to the operator, the assistants, or the horse, in a protracted operation like this, when the side-line only has been used.

The details of the operation belong to the veterinary surgeon. The grand points to be attended to are to have the edge of the iron round and smooth—the iron itself at, or rather below a red heat—to pass it more or less rapidly over the skin, and with slighter or greater pressure according to the degree of heat—to burn into the skin until the line produced by the iron is of a brown colour, rather light than dark, and, by all means, to avoid *penetrating* the skin. Leaving the additional cruelty of deep firing out of the question, we may depend on it that if the skin is burned through, inflammation, and ulceration, and sloughing will ensue, which will be with much difficulty combated—which will unavoidably leave unnecessary blemish, and which have destroyed many valuable horses. It may happen, nevertheless, that by a sudden plunge of the animal the skin will be unavoidably cut through. The act of firing requires much skill and tact, and the practitioner cannot be always on his guard against the struggles of the tortured beast. It will, also, and not unfrequently occur, that the skin, partially divided, will separate in two or three days after the operation. This must not be attributed to any neglect or unskilfulness of the surgeon, and the ulceration thus produced will be slight and easily treated, compared with that caused by the actual burning through of the skin.

Some practitioners blister immediately after firing. As a general usage it is highly to be reprobated. It is wanton and useless cruelty; but it may be required in bony tumours of considerable extent, and long standing, and interfering materially with the action of the neighbouring joint. Spavin accompanied by much lameness, and ring-bone spreading round the coronet, and involving the side cartilages, or the pastern joint, may justify it. The inflammation is rendered more intense, and of considerably longer duration. In old affections of the round bone it may be admitted, but no excuse can be made for it in slighter cases of sprain or weakness, or staleness.

On the day after the operation, it will be prudent gently to rub some neat's foot oil, or lard over the lines. This will soften the skin, and render it less likely to separate or ulcerate; a bandage would add to the irritation of the part. Any cracks of the skin, or ulcerations that may ensue, must be treated with the calamine ointment already recommended.

It will be evident that there is an advantage derived from firing to which a blister can have no pretension. The skin, partially destroyed by the iron, is reinstated and healed, not merely by the formation of some new matter filling up the vacuity, but by the gradual drawing together and closing of the separated edges. The skin, therefore, is lessened in surface; it is tightened over the part, and it acts as a salutary and permanent bandage. Of the effect of pressure in removing enlargements of every kind, as well as giving strength to the part to which it is applied, we have repeatedly spoken; and it is far from being the least valuable effect of the operation of firing, that, by contracting the skin, it affords a salutary, equable, and permanent pressure. It was on this principle, but the practice cannot be defended, that colts which were not very strong on the legs, used to be fired round the fetlock, and along the back sinew, or over the hock, to brace and strengthen the parts. It is on the same principle that a racer or hunter, that has become stale and stiff, is sometimes fired and turned out. For whatever reason the horse is fired, he should, if practicable, be turned out, or soiled in a loose box, for three or four months at least. The full effect intended to result from the external irritation is not soon produced, and the benefit derived from pressure proceeds still more slowly. In the thickened and tender state of the skin, and the substance beneath, for some weeks after firing, a return to hard work would be likely to excite a new inflammation, and cause even worse mischief than that which before existed.

Some weeks pass before the tumified parts begin to lessen, and they only who have had experience in these cases would imagine how long, with gentle voluntary exercise, the process of absorption is carried on. He, therefore, who would expect that much good should accrue from the operation of firing, must be content to give up his horse for three or four months; but if he will use him sooner, and a worse lameness should follow, let him blame his own impatience, and not the inefficiency of the means, or the want of skill in the surgeon.

The firing in every case should be either in longitudinal or parallel lines. On the back sinews, the fetlock, and the coronet, this is peculiarly requisite, for thus only will the skin contract so as to form the greatest and most equable pressure.

The practitioner may pride himself in the accuracy of his diamonds, lozenges and feathers, but plain straight lines, about half an inch from each other, will form the most advantageous mode of firing. The destroying of deeply seated inflammation, by the exciting of violent inflammation on the skin, is as well obtained; and common sense will determine, that in no way can the pressure which results from the contraction of the skin be so advantageously employed, to which we may add, that it often leaves not the slightest blemish.

SETONS

Are pieces of tape or cord, passed by means of an instrument resembling a large needle either through abscesses, or the base of ulcers with deep sinuses, or between the skin and the muscular or other substances beneath. They are retained there by the ends being tied together, or by a knot at each end. The tape is moved in the wound twice or thrice in the day, and occasionally wetted with spirit of turpentine, or some acrid liquid, in order to increase the inflammation which it produces, or the discharge which is intended to be established.

In abscesses, such as tumours in the withers or the poll, and when passed from the summit to the very bottom of the swelling, setons are highly useful, as discharging the fluid and suffering any fresh quantity of it that may be secreted to flow out; and, by the degree of inflammation which they excite on the inside of the tumour, stimulating it to throw out healthy granulations which gradually occupy and fill the hollow. In deep fistulous wounds they are indispensable, for except some orifice be made for the matter to flow from the bottom of the wound, it will continue to eat deeper into it, and the healing process can never be accomplished. On these accounts, a seton passed through the bottom of the ulcer in poll-evil and fistulous withers is of so much benefit.

Setons are sometimes useful by promoting a discharge in the neighbourhood of an inflamed part, and thus diverting and carrying away a portion of the fluids which overload, or would otherwise more distend the vessels of that part: thus a seton is placed in the cheek with considerable advantage, when the eyes are inflamed; we confess, however, that we far prefer a rowel under the jaw.

With this view, and to excite a new and different inflammation in the neighbourhood of a part already inflamed, and especially so deeply seated and so difficult to be got at as the navicular joint, a seton has occasionally been used with manifest benefit, but we must peremptorily object to the indiscriminate use of the frog-seton for almost every disease of the frog or the foot.

In inflammations of extensive organs setons afford only feeble aid. Their action is too circumscribed. In inflammation of the chest or the intestines a rowel is preferable to a seton; and a blister is far better than either of them.

On the principle of exciting the absorbents to action for the removal of tumours, as spavin or splent, a blister is quicker in its action, and far more effectual than any seton; and firing is still more energetic. Many horses have been blemished for life by the seton being torn out, and ulcerations, difficult to heal, having been produced; while week after week has often passed on, and the owner has been deprived of the use of the animal, without the tumour, or the lameness which it caused, being in the least degree diminished.

DOCKING.

The shortening of the tail of the horse is an operation which fashion and the convenience of the rider require to be performed on most of those animals. The length of the dock, or stump, is a matter of mere caprice. To the close-cropped tail of the waggon-horse, however, we decidedly object, from its perfect ugliness, and because the animal is deprived of every defence against the flies. The supposition that the blood which should have gone to the nourishment of the tail, causes greater development and strength in the quarters, is too absurd to deserve serious refutation. It is the rump of the animal being wholly uncovered, and not partly hidden by the intervention of the tail, that gives a false appearance of increased bulk.

The operation is simple. That joint is searched out which is the nearest to the desired length of tail. The hair is then turned up, and tied round with tape for an inch or two above this joint; and that which lies immediately upon the joint is cut off. The horse is then fettered with the side line, and the veterinary surgeon with his docking machine, or the farmer with his carving knife and mallet, cuts through the tail at one stroke. Considerable bleeding now ensues, and frightens the timid or the ignorant; but if the blood were suffered to flow on until it ceased of its own accord, the colt, and especially if he were very young, would rarely be seriously injured. As, however, the bleeding would occasionally continue for some hours, and a great quantity of blood would be lost, and the animal would be somewhat weakened, it is usual to stop the hæmorrhage by the application of a red-hot iron to the stump. A large hole is made in the centre of the iron, that the bone may not be seared, which would exfoliate, if it were burned with any severity, or drop off at the joint above, and thus shorten the dock. The iron rests on the muscular parts round the bone, and is brought into contact with the bleeding vessels, and very speedily stops the hæmorrhage. Care should be taken that the iron is not too hot,—and that it is not held too long or too forcibly on the part, for many more horses would be destroyed by severe application of the cautery, than by the bleeding being left to its own course. Powdered resin sprinkled on the stump, or indeed any other application, is worse than useless; it causes unnecessary irritation, and sometimes extensive ulceration; but if the simple iron be moderately applied, the horse may go to work immediately after the operation, and no dressing will be afterwards required. If a slight bleeding should occur after the cautery, it is much better to let it alone, than to run the risk of inflammation or locked-jaw, by re-applying the iron with greater severity.

Some farmers dock their colts a few days after they are dropped. This is a commendable custom on the score of humanity; no colt was ever lost by it; and we do not believe that the growth of the hair or the beauty of the tail is in the least impaired.

NICKING.

This barbarous operation has been long sanctioned by fashion, and the breeder and the dealer must have recourse to it, if he would obtain a ready sale for his colts. It is not, however, practised to the extent that it used to be, nor attended by so many circumstances of cruelty.

We must here introduce a small portion of our anatomy, which we had reserved for this place. We have spoken, p. 165, of the eighteen dorsal vertebræ or bones of the back (see *d*, page 163), and the five lumbar vertebræ, or bones of the loins (*f*, p. 163). The continuation of the spine consists of the sacrum or five bones, *h*, p. 163, which, although separate in the colt, are in the full grown horse united into one mass. The bones of the ilium, the upper and side portion of the haunch, articulate strongly with the sacrum, forming a bony union rather than a joint. The spinal marrow, and the blood-vessels generally, here begin to diminish, and numerous branches of nerves are given out, which, joined by some from the vertebræ of the loins, form the nerves of the hind legs.

The bones of the tail, *i*, page 163, are a continuation of those of the sacrum. They are fifteen in number, gradually diminishing in size, and losing altogether the character of the spinal vertebræ. Prolongations of the spinal marrow run through the whole of them, and likewise arterial vessels, being a continuation of those which supply the sacrum. A great deal of attention is paid by those who are acquainted with the horse to this continuation of the sacral and tail bones. From the loins to the *setting on* of the tail, the line should be nearly straight, or inclining only a little way downward. There is not a surer test of the breed of the horse, than this straight line from the loins to the tail; nor, as we have shown, when speaking of the muscles of the quarters, is there any circumstance so much connected with the mechanical advantage with which these muscles act.

The tail was given to the horse to perfect the beauty of his form; to assist in directing his course when he has not the guiding hand of man; and more particularly to enable him to defend himself from the insects by which in every climate he is annoyed.

There are three sets of muscles belonging to the tail, one raising it (*a*, page 260), another depressing it (*b*, page 260), and a third set giving it a side motion in every direction when acting singly, or very powerfully lowering it when acting together. It would seem that the depressor and lateral muscles are much more powerful than the erector muscles, and that when the horse is undisturbed, the tail is bent down close on the buttocks; but when he is excited, and particularly when he is at speed, the erector muscles are called into action, the tail is elevated, and there is given to him an appearance of energy and spirit, which adds materially to his beauty. To perpetuate this character of fire, the operation of *nicking* was contrived. The depressor muscles, and part of the lateral ones are cut through; and the erector muscles are left without any antagonists, and keep the tail in a position more or less erect, according to the whim of the operator, or the depth to which the incisions into the muscles have been carried.

The operation is thus performed. The side line is put on the horse, or some deem it more prudent to cast him, and that precaution we should be disposed to recommend. The hair at the end of the tail is securely tied together for the purpose of afterwards attaching a weight to it. The operator then grasps the tail in his hand, and lifting it up, feels for the *centre* of one of the bones (the prominences at the extremities will guide him to this), from two to four inches from the root of the tail, according to the size of the horse. He then with a sharp knife divides the muscles deep from the edge of the tail on one side to the centre, and continuing the incision across the bone of the tail, he makes it as deep on the other side. One continued incision, steadily, yet rapidly made, will accomplish this. If it be a blood horse this will be sufficient. For a hunter, two incisions are usually made, the second being about two inches below the first, and likewise as nearly as possible in the centre of one of the bones; the reason of which is, that the incision, in order perfectly to divide the muscles that bring down the tail, must be so deep, as, in the neighbourhood of a joint, to endanger the wounding of the ligament which ties the bones together, or the substance which is interposed between the joints, and thus by destroying the joint to render the tail deformed.

On a hackney or *cocktail*, a third incision is made; for fashion has decided that his tail shall be still more elevated and curved. Two incisions only are made in the tail of a mare, and the second not very deep.

When the second incision is made, some fibres of the muscles between the first and second incisions will project into the wounds, and which must be removed with a pair of curved scissors. The same must be done with the projecting portions from between the second and third incisions; and the wounds should be carefully examined to ascertain that the muscles have been equally divided on each side, otherwise the tail will be carried awry. This being done, pledgets of tow must be introduced deeply into each gap, and confined, but not too tightly, by a bandage. A very profuse bleeding will alone justify any tightness of bandage; and the ill consequences which have resulted from nicking are mainly attributable to the unnecessary force which is used in confining these pledgets. Even if the bleeding, immediately after the operation, should have been very great, the roller must be loosened in two or three hours, otherwise swelling and inflammation, or death, may possibly ensue. Twenty-four hours after the operation, the bandage must be quite removed; and then, all that is necessary, so far as the healing of the wounds is concerned, is to keep them clean.

If, however, the tail were suffered to hang down, the divided edges of the muscles would come again in contact with each other and close; the natural depression of the tail would remain; and the animal would have been punished for no purpose. The wounds must be kept open, and that can only be accomplished by forcibly keeping the tail curved back, for two or three weeks. For this purpose, a cord, one or two feet in length, is affixed to the end of the hair, which terminates in another divided cord, each division going over a pulley on either side of the back of the stall. A weight is hung at either extremity, sufficient to keep the incisions properly open, and regulated by the degree in which this is wished to be accomplished. The animal will thus be retained in an uneasy position, although, after the first two or three days, probably not one of acute pain. It is barbarous to increase this uneasiness or pain by affixing too great a weight to the cords; for it should be remembered, that the proper elevated curve is given to the tail, *not by the weight keeping it in a certain position for a considerable time*, but by the depth of the first incisions, and the degree in which the wounds are kept open. By every ounce of weight beyond that which is necessary to keep the incisions open, unnecessary suffering is inflicted. Some practitioners use only one pulley; others do not use any, but put on a light girth, and tie a cord from the end of the tail to the girth, bending it over the back. The double pulley, however, is the least painful to the horse, and more perfectly secures the proper elevation and straight direction of the tail.

The dock should not, for the first three or four days, be brought higher than the back. Dangerous irritation and inflammation would probably be produced. It may, after that, be gradually raised to an elevation of forty-five degrees. The horse should be taken out of the pulleys, and gently exercised once or twice every day; but the pulleys cannot finally be dispensed with, until a fortnight after the wounds have healed, because the process of contraction, or the approach of the divided parts, goes on for some time after the skin is perfect over the incisions; and the tail would thus sink below the desired elevation.

If the tail has not been unnecessarily extended by enormous weights, no bad consequences will usually follow; but if considerable inflammation should ensue, the tail must be taken from the pulley, and diligently fomented with simple warm water, and a dose of physic given. Locked jaw has in some rare instances followed, under which the horse generally perishes. The best means of cure in the early state of locked jaw is to amputate the tail at the joint above the highest incision. In order to prevent the hair from coming off, it should be unplatted and combed out every fourth or fifth day.

Chapter XIX.

THE VICES, AND DISAGREEABLE OR DANGEROUS HABITS OF THE HORSE.

The horse has many excellent qualities, but he has likewise defects, and these occasionally amounting to vices. Some of them may be attributed to natural temper; for the human being scarcely discovers more peculiarities of habit and disposition, than does the horse. The majority of them, however, as perhaps in the human being, are consequences of a faulty education. Their early instructor has been both ignorant and brutal, and they have become obstinate and vicious.

RESTIFNESS.

At the head of the vices of the horse we place RESTIFNESS, the most annoying, and the most dangerous of all. It is the produce of bad temper and worse education; and, like all other habits founded on nature and stamped by education, it is inveterate. Whether it appears in the form of kicking, or rearing, or plunging, or bolting, or in any way that threatens danger to the rider or the horse, it rarely admits of cure. A determined rider may, to a certain degree, subjugate the animal; or the horse may have his favourites, or form his attachments, and with some particular person he may be comparatively or perfectly manageable; but others cannot long depend upon him, and even his master is not always sure of him. We will speak of the most likely means of cure, or escaping from danger, as it regards the principal forms under which restifness displays itself; but we must premise as a rule that admits of very few exceptions that he neither displays his wisdom, nor consults his safety, who attempts to conquer a restiff horse.

An excellent veterinary surgeon, and a man of great experience in horses, Mr. Castley, truly says, in 'The Veterinarian,' 'From whatever cause the vicious habits of horses may originate, whether from some mismanagement, or from natural badness of temper, or from what is called in Yorkshire a *mistetch*, whenever these animals acquire one of them, and it becomes in some degree confirmed, they very seldom, if ever, altogether forget it. In reference to driving, it is so true, that it may be taken as a kind of aphorism, that if a horse kicks once in harness, no matter from what cause, he will be liable to kick ever afterwards. A good coachman may drive him, it is true—and may make him go, but he cannot make him forget his vice; and so it is in riding. You may conquer a restiff horse; you make him ride quiet for months, nay, almost for years together, but I affirm, that under other circumstances, and at some future opportunity, he will be sure to return to his old tricks again.'

Mr. Castley gives two singular and conclusive instances of the truth of this doctrine. 'When a very young man,' says he, 'I remember purchasing a horse at a fair in the north of England, that was offered very cheap on account of his being unmanageable. It was said that nobody could ride him. We found that the animal objected to have anything placed upon his back, and that, when made to move forward with nothing more than a saddle on, he instantly threw himself down on his side with great violence, and would then endeavour to roll upon his back.

'There was at that time in Yorkshire, a famous colt-breaker, known by the name of JUMPER,* who was almost as celebrated in that country for taming vicious horses into submission, as the famed WHISPERER was in Ireland. We put this animal into Jumper's hands, who took him away, and in about ten days brought him home again, certainly not looking worse in condition, but perfectly subdued and almost as obedient as a dog: for he would lie down at this man's bidding, and only rise again at his command, and carry double or anything. I took to riding him myself, and may say, that I was never better carried for six or eight months, during which time he never shewed the least vice whatever. I then sold him to a Lincolnshire farmer, who said that he would give him a summer's run at grass, and shew him a very fine horse at the great Horncastle fair.

'Happening to meet this gentleman the following year, I naturally enough inquired after my old friend. "Oh," said he, "that was a bad business—the horse turned out a sad rebel. The first time we attempted to mount him, after getting him up from grass, he in an instant threw the man down with the greatest violence, pitching him several yards over his head; and after that he threw every one that attempted to get on his back. If he could not throw his rider, *he would throw himself down*. We could do nothing with him, and I was obliged at last to sell him to go in a stage-coach."'

In the next story, Jumper's counterpart and superior, the Irish Whisperer, is brought on the stage, and, although he performs wonders, *he* cannot radically cure a restiff horse. 'At the Spring Meeting of 1804, Mr. Whalley's KING PIPPIN was brought on the Curragh of Kildare to run. He was a horse of the most extraordinary savage and vicious disposition. His particular propensity was that of *flying at and worrying* any person who came within his reach, and if he had an opportunity, he would get his head round, seize his rider by the leg with his teeth, and drag him down from his back. For this reason he was always ridden in what is called *a sword;* which is nothing more than a strong flat stick, having one end attached to the cheek of the bridle, and the other to the girth of the saddle, a contrivance to prevent a horse of this kind from getting at his rider.

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* Those of our readers who were connected with the contested elections for Yorkshire, will recollect Jumper, covered with orange plush from top to toe, and scampering in every direction over the country. Sometimes he would exchange this for a bear-skin, enveloped in which, and mounted occasionally on a buffalo, he was a most formidable object. He had extraordinary power over animals of various species, for he tamed to the saddle a buffalo for Mr. Tempest, and a pair of rein-deer for harness for Lord Fitzwilliam. But his charm consisted chiefly in fearlessness, and brute force, accompanied by considerable tact. He would generally try rough measures first; and in his perilous encounters with some of his troublesome scholars, had nearly every bone in his body fractured. Sullivan's method was altogether different—force was rarely resorted to. The enemy surrendered to him at discretion and without a struggle. Jumper, however, seemed to have some charm about him, for when he had, by dint of punishment, striven in vain to conquer an unruly horse in the market-place of Wakefield—he alighted—stood on the near side of the horse—brought the animal's head almost back to his off shoulder by forcibly pulling at the off rein, and then sternly gazed at him over the withers for two or three minutes. The animal began to tremble, and broke out into a profuse perspiration. Jumper then loosened his hold of the rein, and patted and caressed the horse, who immediately followed him round the market-place perfectly tamed.

'King Pippin had long been difficult to manage and dangerous to go near, but on the occasion in question he could not be got out to run at all. *Nobody could put the bridle upon his head.* It being Easter Monday, and consequently a great holyday, there was a large concourse of people assembled at the Curragh, consisting principally of the neighbouring peasantry; and one countryman, more fearless than the rest of the lookers-on, forgetting, or perhaps never dreaming that the better part of courage is discretion, volunteered his services to bridle the horse. No sooner had he committed himself in this operation, than King Pippin seized him somewhere about the shoulders or chest, and says Mr. Watts (Mr. Castley's informant), "I know of nothing I can compare it to, so much as a dog shaking a rat." Fortunately for the poor fellow, his body was very thickly covered with clothes, for on such occasions an Irishman of this class is fond of displaying his wardrobe, and if *he has three coats at all in the world*, he is sure to put them all on.

'This circumstance in all probability saved the individual who had so gallantly volunteered the forlorn hope. His person was so deeply enveloped in extra-teguments, that the horse never got fairly hold of his skin, and I understand that he escaped with but little injury, beside the sadly rent and totally ruined state of his holyday toggery.

'The Whisperer was sent for, who having arrived, was shut up with the horse all night, and in the morning he exhibited this hitherto ferocious animal, following him about the course like a dog—lying down at his command—suffering his mouth to be opened, and any person's hand to be introduced into it—in short, as quiet almost as a sheep.

'He came out the same meeting, and won a race, and his docility continued satisfactory for a long time; *but at the end of about three years his vice returned*, and then he is said to have *killed a man*, for which he was destroyed.'

It may not be uninteresting in this connexion, to give some account of this tamer of quadruped vice. However strange and magical his power may seem to be, there is no doubt of the truth of the account that is given of him. The Rev. Mr. Townsend, in his Statistical Survey of Cork, first introduced him to the notice of the public generally, although his fame had long spread over that part of Ireland. We, however, give the following extract from Croker's Fairy Legends and Traditions of Ireland, Part II. p. 200, for the fact seems the work of some elfin sprite, rather than of a rude and ignorant horse-breaker.

'He was an awkward, ignorant rustic of the lowest class, of the name of Sullivan, but better known by the appellation of the Whisperer; his occupation was horse-breaking. The nickname he acquired from the vulgar notion of his being able to communicate to the animal what he wished by means of a whisper, and the singularity of his method seemed in some degree to justify the attribute. In his own neighbourhood, the notoriety of the fact made it seem less remarkable, but I doubt if any instance of similar subjugating talent is to be found on record. As far as the sphere of his control extended, the boast of *veni, vidi, vici*, was more justly claimed by Sullivan than by Cæsar himself.

'How his art was acquired, and in what it consisted, is likely to be for ever unknown, as he has lately (about 1810) left the world without divulging it. His son, who follows the same trade, possesses but a small portion of the art, having either never learned the true secret, or being incapable of putting it into practice. The wonder of his skill consisted in the celerity of the operation, which was performed in privacy without any apparent means of coercion. Every description of horse, or even mule, whether previously broken or unhandled, whatever their peculiar habits or vices might have been, submitted without show of resistance to the magical influence of his art, and in the short space of half an hour became gentle and tractable. This effect, though instantaneously produced, was generally durable. Though more submissive to him than to others, they seemed to have acquired a docility unknown before.

'When sent for to tame a vicious beast, for which he was either paid according to the distance, or generally two or three guineas, he directed the stable, in which he and the object of the experiment were, to be shut, with orders not to open the door until a signal was given. After a *tête-à-tête* of about half an hour, during which little or no bustle was heard, the signal was made, and, upon opening the door, the horse appeared lying down, and the man by his side, playing with him like a child with a puppy dog. From that time he was found perfectly willing to submit to any discipline —however repugnant to his nature before.' 'I once,' continues Mr. Townsend, 'saw his skill tried on a horse, which could never before be brought to stand for a smith to shoe him. The day after Sullivan's half hour's lecture, I went, not without some incredulity, to the smith's shop, with many other curious spectators, where we were eye-witnesses of the complete success of his art. This, too, had been a troop horse, and it was supposed, not without reason, that after regimental discipline had failed, no other would be found availing. I observed that the animal appeared terrified whenever Sullivan either spoke or looked at him; how that extraordinary ascendancy could have been obtained, is difficult to conjecture.

'In common cases this mysterious preparation was unnecessary. He seemed to possess an instinctive power of inspiring awe, the result, perhaps, of natural intrepidity, in which, I believe, a great part of his art consisted; though the circumstance of the *tête-à-tête* shows that, on particular occasions, something more must have been added to it. A faculty like this would in some hands have made a fortune, and I understand that great offers were made to him, for the exercise of his art abroad. But hunting was his passion. He lived at home in the style most agreeable to his disposition, and nothing could induce him to quit Duhallow and the fox hounds.'

Mr. Castley witnessed the total failure of the younger Sullivan. He says, 'We have in the regiment a remarkably nice horse, called Lancer, that has always been very difficult to shoe, but seven or eight years ago, when we first got him, he was downright vicious in that respect. When the regiment was stationed at Cork, the farrier-major sought out the present Sullivan, the son of the celebrated Whisperer, and brought him up to the barracks in order to try his hand upon Lancer, and make him more peaceable to shoe; but I must say this person did not appear to possess any particular controlling power over the animal, more than any other man. Lancer seemed to pay no attention whatever to his charm, and, at last, fairly beat him out of the forge. Time, however, and a long perseverance in kind and gentle treatment, have effected what force could not. The horse is now pretty reasonable to shoe.'

BACKING OR GIBBING.

One of the first species of restifness, taking them in alphabetical order, is BACKING OR GIBBING. These are so closely allied that we hardly know how to separate them. Some horses have the habit of backing at first starting, and that more from playfulness than desire of mischief. A moderate application of the whip will usually be effectual. Others, even at starting, exhibit considerable obstinacy and viciousness. This is frequently the effect of bad breaking. Either the shoulder of the horse had been wrung when he was first put to the collar, or he had been foolishly accustomed to start in the break *up-hill*, and, therefore, all his work coming upon him at once, when it being much more difficult to draw the break up-hill, than to back and let it run down-hill, he gradually acquired this dangerous habit.

A hasty and passionate breaker will often make a really good tempered young horse an inveterate gibber. Every young horse is at first shy of the collar. If he be too quickly forced to it, he will possibly take a dislike to it, that will occasionally show itself in the form of gibbing as long as he lives. The judicious horse-breaker will resort to no severity, even if the colt should go out several times without touching collar. The example of his companion will ultimately induce him to take to it voluntarily and effectually.

A large and heavy stone should be put behind the wheel before starting, when the horse, finding it more difficult to back than to go forward, will gradually forget this unpleasant trick. It will likewise be of advantage, as often as it can be managed, so to start that the horse shall have to back up-hill. The difficulty of accomplishing this will soon make him readily go forward at once. A little coaxing, or leading, or moderate flagellation, will assist in accomplishing the cure.

When, however, a horse, thinking that he has had enough of work, or has been improperly checked or corrected, or beginning to feel the painful pressure of the collar, swerves, and gibs, and backs, it is a more serious matter. Persuasion should here first be tried; and, afterwards, reasonable coercion, but no cruelty: for the brutality which is often exercised in attempting to compel a gibbing horse to throw himself habitually into the collar, never yet accomplished the purpose. The horse may, perhaps, be whipped into motion, but if he has once begun to gib, he will have recourse to it again whenever any circumstance displeases or annoys him; and the habit will be rapidly, and so completely formed, that he will become insensible to all severity.

It is useless and most dangerous to contend with a horse determined to back, unless there is plenty of room, and, by tight reining, the driver can make him back in the precise direction he wishes, and especially up-hill. Such a horse should be immediately sold, or turned over to some other work. In a stage-coach as a wheeler, and particularly as the near-wheeler; or, in the middle of a team at agricultural work, he may be serviceable. It will be useless for him to attempt to gib there, for he will be dragged along by his companions whether he will or no; and, finding the inutility of resistance, he will soon be induced to work as well as any horse in the team. This reformation will last while he is thus employed, but, like restifness generally, it will be delusive when the horse returns to his former occupation. The disposition to annoy will very soon follow the power to do it. Some instances of complete reformation have occurred, but they have been rare.

When a horse, not often accustomed to gib, betrays a reluctance to work, or a determination not to work, common sense and humanity will demand that some consideration should be taken, before measures of severity be resorted to. The horse may be taxed beyond his power. He soon discovers whether this is the case, and by refusing to proceed, tells his driver that it is so; and the utmost cruelty will not induce many horses to make the slightest effort, when they are conscious that their strength is inadequate to the task. Sometimes the withers are wrung, and the shoulders sadly galled; and the pain, which is intense on level ground and with fair draught, becomes insupportable when he tugs up a steep acclivity. These things should be examined into, and, if possible, rectified; for, under such circumstances, cruelty might produce obstinacy and vice, but not willing obedience.

Those who are accustomed to horses know what seemingly trivial circumstances occasionally produce this vice. A horse, whose shoulders are raw, or that have frequently been so, will not start with a cold collar. When the collar has acquired the warmth of the parts on which it presses, the animal will go without reluctance. Some determined gibbers have been reformed by constantly wearing a false collar, or strip of cloth round the shoulders, so that the coldness of the usual collar should never be felt; and others have been cured of gibbing by keeping the collar on night and day, although the animal is not able to lie down so completely at full length, which the tired horse is always glad to do. When a horse gibs, not at starting, but while doing his work, it has sometimes been useful to line the collars with cloth instead of leather; the perspiration is readily absorbed, the substance which presses on the shoulders is softer, and it may be far more accurately eased off at a tender place.

BITING.

This is either the consequence of natural ferocity, or a habit acquired from the foolish and teasing play of grooms and stable boys. When a horse is tickled and pinched by thoughtless and mischievous youths, he will first pretend to bite his tormentors; by degrees he will proceed farther, and actually bite them, and, very soon after that, he will be the first to challenge to the combat, and without provocation seize some opportunity to gripe the incautious groom; and then, as the love of mischief is a propensity too easily acquired, this war, half playful, and half in earnest, will become habitual to him, and will degenerate into absolute viciousness. Nothing can here be done in the way of cure; kindness would aggravate the evil, and no degree of severity will correct it. Prevention, however, is in the power of every proprietor of horses. While he insists on gentle and humane treatment of his cattle, he should systematically forbid this horse-play. It is that which can never be considered as operating as a reward, and thereby rendering the horse tractable; nor does it increase the affection of the animal for his groom, because he is annoyed and irritated by being thus incessantly teased.

GETTING THE CHEEK OF THE BIT INTO THE MOUTH.

Some horses that are disposed to be mischievous try to do this, and are very expert at it. They soon find what advantage it gives them over their driver, who by this manœuvre loses almost all command. Harsh treatment is here completely out of the question. All that can be done is, by some mechanical contrivance, to render the thing difficult or impossible, and this may be managed by fastening a round piece of leather on the inside of the cheek of the bit.

KICKING.

This, as *a vice*, is another consequence of the culpable habit of grooms and stable-boys of teasing the horse. That which is at first an indication of annoyance at the pinching and tickling of the groom, and without any design to injure, gradually becomes the expression of anger, and the effort at mischief. There is no cure for this vice; and he cannot be justified who keeps such a kicking horse in his stable.

Some horses acquire a habit of kicking at the stall or the bail, and particularly at night, from mere irritability and fidgettiness. The neighbouring horses are disturbed, and the kicker gets swelled hocks, or some more serious injury. This is also a habit very difficult to correct if suffered to become established. Mares are far more subject to it than horses.

Before the habit is inveterately established, a thorn bush or a piece of furze fastened against the partition or post will sometimes effect a cure. When the horse finds that he is pretty severely pricked he will not long continue to punish himself. In confirmed cases it may be necessary to have recourse to the log, but the legs are often not a little bruised by it. A rather long and heavy piece of wood attached to a chain is buckled above the hock, so as to reach about half way down the leg. When the horse attempts to kick violently, his leg will receive a severe blow from this, and the repetition of the blow will soon teach him to be quiet.

A much more serious vice is kicking in harness. From the least annoyance about the rump or quarters, some horses will kick at the most violent rate, and destroy the bottom of the chaise, and endanger the limbs of the driver. Those that are fidgetty in the stable are most apt to do this. If the reins should perchance get under the tail, the violence of the kicker will be most outrageous; and while the animal presses down his tail so tightly that it is almost impossible to extricate the reins, he continues to plunge until he has demolished every thing behind him.

This is a vice standing foremost in point of danger, and which no treatment will often conquer. It will be altogether in vain to try coercion here. If the shafts are very strong and without flaw, or if they are plated with iron underneath, and a stout kicking strap used, which will barely allow the horse the proper use of his hind limbs in progression, but not permit him to raise them sufficiently for the purpose of kicking, he may be prevented from doing mischief; or if he is harnessed to a heavy cart, and thus confined, his efforts to lash out will be restrained: but it is a very unpleasant thing frequently to witness these attempts, although ineffectual, to demolish the vehicle; and the shafts or the kicking strap may possibly break, and extreme danger may ensue. A horse that has once begun to kick, whatever may have been the original cause of it, can never be depended on again; and he will be very unwise who ventures behind him.

UNSTEADINESS WHILST BEING MOUNTED.

When this merely amounts to eagerness to start (very unpleasant, indeed, at times, for many a rider has been thrown from his seat before he was fairly fixed in it), it may be remedied by an active and good horseman. We have known many instances in which, while the elderly, and inactive, and fearful man, has been making more than one ineffectual attempt to vault into the saddle, the horse has been dancing about to his annoyance and danger; but the animal had no sooner been transferred to the management of a younger and more agile rider, than he became perfectly subdued. Severity will here, more decidedly than in any other case, do harm. The rider should be fearless;—he should carelessly and confidently approach the horse, mount at the first effort, and then restrain him for a while, patting him, and not suffering him to proceed until he becomes perfectly quiet. These horses should not be too highly fed, and should daily have sufficient exercise.

When the difficulty of mounting arises not from eagerness to start, but unwillingness to be ridden, the sooner such horse is disposed of the better. He may be conquered by a determined rider, but a skilful and determined horseman alone will manage him; and even he will not succeed without frequent and even dangerous contests that will mar all the pleasure of the ride.

REARING.

This sometimes results from playfulness, carried indeed to an unpleasant and dangerous extent; but it is oftener a vice, and is a desperate and frequently successful effort to unhorse the rider. The horse that has twice decidedly and dangerously reared, should never be trusted again, unless indeed it be the fault of the rider—unless he has been using a deep curb and sharp bit. Some of the best horses will contend against these, and then rearing may be immediately and permanently cured by using a snaffle bridle alone.

The horse-breaker's remedy, that of pulling the horse backward on a soft piece of ground, is worthy of him, and would be practised only by reckless and brutal men. Many horses have been injured in the spine, and others have broken their necks, by being thus suddenly brought over; while even the horse-breaker, who fears no danger, is not always able to extricate himself from the falling horse. If rearing proceeds from vice, and is unprovoked by the bruising and laceration of the mouth, it fully partakes of the inveteracy which attends the other divisions of restiveness.

RUNNING AWAY.

Some headstrong horses will occasionally endeavour to bolt with the best rider. Others, with their wonted sagacity, endeavour thus to dislodge the timid or unskilful. Some are hard to hold, or bolt only during the excitement of the chace; others will run away, prompted by a vicious propensity alone. There is no cure here. That method which affords any probability of success, is to ride such a horse with a strong curb and sharp bit; to have him always firmly in hand; and if he will run away, and the place will admit of it, to give him (sparing neither curb, whip, nor spur) a great deal more running than he likes.

VICIOUS TO CLEAN.

It would scarcely be believed to what an extent this exists in some horses, that are otherwise perfectly quiet. It is only at great hazard that they can be cleaned at all. The origin of this is probably some maltreatment. There is a great difference in the sensibility of the skin in different horses. Some seem as if they could scarcely be made to feel the whip; others cannot bear a fly to alight on them without an expression of annoyance. In young horses the skin is peculiarly delicate. If they have been curried with a broken comb, or hardly rubbed with an uneven brush, the recollection of the torture they have felt makes them impatient, and even vicious, during every succeeding operation of the kind. Many grooms, likewise, seem to delight in producing these exhibitions of uneasiness and vice; although when they are carried a little too far, and to the hazard of the limbs of the groom, the animals that have been almost tutored into these expressions of irritation, are brutally kicked and punished.

This, however, is a vice which may be conquered. If the animal be dressed with a lighter hand, and wisped rather than brushed, and the places where the skin is most sensitive be avoided as much as thorough cleanliness will allow, the horse will gradually lose the recollection of former ill-treatment, and become tractable and quiet.

VICIOUS TO SHOE.

The correction of this is more peculiarly the business of the smith; yet the master should diligently concern himself with it, for it is oftener the consequence of injudicious or bad usage than of natural vice. It may be expected that there will be some difficulty in shoeing a young horse for the first few times. It is an operation which gives him a little uneasiness. The man to whom he is most accustomed should go with him to the forge; and if another and steady horse were shod before him, he might be induced more readily to submit. We cannot deny, that after the habit of resisting this necessary operation is formed, force may sometimes be necessary to reduce our rebellious servant to obedience; but we affirm that the majority of horses *vicious to shoe* are rendered so by harsh usage, and by the pain of correction being added to the uneasiness of shoeing. It should be a rule in every forge that no smith should be permitted to strike a horse, much less to twitch or to gag him, without the master-farrier's order; and that a young horse should never be twitched or struck. There are few horses that may not be gradually rendered manageable for this purpose by mildness and firmness in the operator. They will soon understand that no harm is meant, and they will not depart from their usual habit of obedience; but if the remembrance of corporal punishment is connected with shoeing, they will always be fidgety, if not dangerous.

This is a very serious vice, for it not only exposes the animal to occasional severe injury from his own struggles, but also from the correction of the irritated smith, whose limbs, and even whose life being in jeopardy, may be forgiven if he is sometimes a little too hard-handed. Such a horse is very liable, and without any fault of the smith, to be pricked and lamed in shoeing; and if the habit should be confirmed, and should increase, and it at length becomes necessary to cast him, or to put him in the trevis, the owner may be assured that many years will not pass ere some formidable and even fatal accident will take place. If, therefore, mild treatment will not correct the vice, the horse cannot be too soon got rid of.

Horses have many unpleasant *habits* in the stable and the road, which cannot be said to amount to *vice*, but which materially lessen their value.

SWALLOWING WITHOUT GRINDING.

Some greedy horses swallow their corn without properly grinding it, and the power of digestion not being adequate to the dissolving of the husk, no nutriment is extracted, and the oats are voided whole. This is particularly the case when horses of unequal appetite feed from the same manger. The greedy one, in his eagerness to get more than his share, bolts a portion of his corn whole. If the farmer can, without considerable inconvenience, so manage it that every horse shall have his separate division of the manger, the horse of smaller appetite and slower feed would have the opportunity of grinding at his leisure, without the fear of his share being stolen from him by his neighbour.

Some horses, however, are naturally greedy feeders, and will not, even when alone, allow themselves time to chew or grind their corn. In consequence of this, they carry but little flesh; they are not equal to severe work; and, if their rack has been supplied with hay when the corn was put into the manger, their stomachs will become distended with half-chewed and indigestible food; they will be incapable of exertion for a long time after feeding, and, occasionally, dangerous symptoms of staggers will occur. The remedy is, not to let such horses fast too long. The nose-bag should be the companion of every considerable journey. The food should likewise be of such a nature that it cannot be easily bolted. Chaff should be plentifully mixed with the corn, and in some cases, and especially in horses of slow work, should, with the corn, constitute the whole of the food. Of this we shall treat more largely under the article 'Feeding.'

In every case of this kind the teeth should be very carefully examined. Some of them may be unduly lengthened, particularly the first of the grinders; or they may be ragged at the edges, and may scratch and wound the cheek. In the first case the horse *cannot* properly masticate his food; in the latter he *will not:* for these animals, as too often happens in sore throat, would rather starve than put themselves to much pain.

CRIB-BITING.

This is a very unpleasant habit, and a considerable defect, although not so serious a one as some have represented. The horse lays hold of the manger with his teeth, violently extends his neck, and then, after some convulsive action of the throat, a slight grunting is heard, accompanied by an apparent sucking or drawing in of air. Whether, however, air is actually drawn in, and thus the horse becomes more subject to colic than one without this trick, or whether a portion of air is expelled, shewing the previous existence of flatulence and a disposition to colic, are points that have not been settled among veterinarians.

The horse is evidently making the edge of the manger a fixed point, by means of which he may overcome that obstacle which the formation of the soft palate and the back part of the mouth (see page 152) would present to either the expulsion or drawing in of the air, if accomplished through the medium of the mouth. When we consider, however, that any air expelled from the stomach might easily find a passage through the nostril, without the action of crib-biting; while it would be difficult or impossible, without some alteration in the natural form and action of the parts at the back of the mouth, and particularly the depression of the epiglottis or covering of the windpipe, to convey air to the stomach, we are inclined to conclude, that this fixed point is used to enable the animal to accomplish this alteration, and suck up and convey a portion of air into the stomach.

The effect of crib-biting is plain enough. The teeth are injured and worn away, and that, in an old horse, to a very serious degree; a considerable quantity of corn is often lost, for the horse will frequently crib with his mouth full of corn, the greater part of which will fall over the edge of the manger; and much saliva flows out while the manger is thus forcibly held, the loss of which must be of serious detriment, as impairing the digestion. The crib-biting horse is notoriously more subject to colic than other horses usually are, and to a species difficult of treatment, and even dangerous. Although many a crib-biter is stout and strong, and capable of all ordinary work, these horses do not generally carry much flesh, and have not the endurance of others. On these accounts, crib-biting has very properly been decided to be unsoundness.

It is one of those tricks which are very contagious. Every companion of a crib-biter in the same stables is likely to acquire the habit, and it is the most inveterate of all habits. The edge of the manger will in vain be lined with iron, or with sheep-skin, or with sheep-skin covered with tar or aloes, or any other unpleasant substance. In defiance of the annoyance which these may occasion, the horse will in a very short time again attack his manger. A strap buckled tightly round the neck, by compressing the windpipe, will prevent the possibility of this action; but the strap must be constantly worn, and its pressure is too apt to produce a worse affection, viz. an irritation in the windpipe, which terminates in roaring.

Some have recommended turning out for five or six months; but this has never succeeded except with a young horse, and then rarely. The old crib-biter will employ the gate for the same purpose as the edge of his manger, and we have seen him gallop across a field for the mere object of having a gripe at a rail. Medicine will be altogether thrown away in this case.

The only remedy is a muzzle, with bars across the bottom; sufficiently wide to enable the animal to pick up his corn and to pull his hay, but not to grasp the edge of the manger. If this be worn a very long time, the horse may be tired of attempting that which he cannot accomplish, and may possibly for a while forget the habit; but in the majority of cases the desire of crib-biting will return with the power of gratifying it.

The causes of crib-biting are various, and some of them beyond the control of the proprietor of the horse. We have said that it is often the result of imitation; but it is more frequently the consequence of idleness. The high-fed and spirited horse must be in mischief, if he is not usefully employed. Sometimes, but we believe not often, it is produced by partial starvation, whether in a bad straw-yard, or from unpalatable food. An occasional cause of crib-biting is the frequent custom of grooms, even when the weather is not severe, of dressing them in the stable. The horse either catches at the edge of the manger, or at the edge of the partition on each side, if he has been turned, and thus he forms the habit of laying hold of these substances on every occasion.

WIND-SUCKING.

This bears a close analogy to crib-biting. It arises from the same causes; the same purpose is accomplished; and the same results follow. The horse stands with his neck bent; his head drawn inward; his lips alternately a little opened and then closed, and a noise is heard as if he were sucking. If we may judge from the same comparative want of condition, and the flatulence which we have described under the last head, either some portion of wind enters the stomach, or there is an injurious loss of saliva. This diminishes the value of the horse almost as much as crib-biting; it is as contagious, and it is as inveterate. The only remedies, and they will seldom avail, are tying the head up, except when the horse is feeding, or putting on a muzzle, with sharp spikes towards the neck, and which shall prick him whenever he attempts to rein his head in for the purpose of wind-sucking.

CUTTING.

Of this habit we have already spoken at page 252, and we would advise the owner of a cutting horse, without trying any previous experiments of raising or lowering the heels, to put on the cutting foot a shoe of even thickness from heel to toe, not projecting in the slightest degree beyond the crust, and the crust itself being rasped a little at the quarters; and to let that shoe be fastened as usual on the outside, but with only one nail on the inside, and that almost close to the toe. The principle on which this shoe acts has been explained at page 243.

NOT LYING DOWN.

It not uncommonly happens that a horse will seldom or never lie down in the stable. He sometimes continues in apparent good health, and feeds and works well; but generally his legs swell, or he becomes fatigued sooner than another horse. If it is impossible to let him loose in the stable, or to put him into a spare box, we know not what is to be done. No means, gentle or cruel, will force him to lie down. The secret is that he is tied up, and either has never dared to lie down through fear of the confinement of the halter, or he has been cast in the night, and severely injured. If he can be suffered to range the stable, or have a comfortable box, in which he may be loose, he will usually lie down the first night. Some few horses, however, will lie down in the stable, and not in a loose box. A fresh, well-made bed will generally tempt the tired horse to lie down.

OVERREACH.

This unpleasant noise, known also by the terms 'clicking,' 'overreach,' &c. arises from the toe of the hind foot knocking against the shoe of the fore foot. In the trot, one fore leg and the opposite hind leg are first lifted from the ground and moved forward, the other fore leg and the opposite hind leg remaining fixed; but, to keep the centre of gravity within the base, and as the stride, or space passed over by these legs, is often greater than the distance between the fore and hind feet, it is necessary that the fore feet should be alternately moved out of the way for the hind feet to descend. Then, as occasionally happens with horses not perfectly broken, and that have not been taught their paces, and especially if they have high hinder quarters and low fore ones, if the fore feet are not raised in time, the hind feet will strike them. The fore foot will generally be caught when it has just begun to be raised, and the toe of the hind foot will meet the middle of the bottom of the fore foot. It is a very disagreeable noise, and not altogether free from danger; for it may so happen that a horse, the action of whose feet generally so much interferes with each other, may advance the hind foot a little more rapidly, or raise the fore one a little more slowly, so that the blow may fall on the heel of the shoe, and loosen or displace it; or the two shoes may be locked together, and the animal may be thrown; or the contusion may be received even higher, and on the tendons of the leg, when considerable swelling and lameness may follow.

If the animal is young, the action of the horse may be materially improved; otherwise nothing can be done, except to keep the toe of the hind foot as short and as round as it can safely be, and to bevil off and round the toe of the shoe, like that which has been worn by a stumbler for a fortnight, and, perhaps, a little to lower the heel of the fore foot.

A blow received on the heel of the fore foot in this manner has not unfrequently, and especially if neglected, been followed by quittor.

PAWING.

Some hot and irritable horses are restless even in the stable, and paw frequently and violently. Their litter is destroyed, the floor of the stable broken up, the shoes worn out, the feet bruised, and the legs sometimes sprained. If this habit does not exist to any great extent, yet the stable never looks well. Shackles are the only remedy, with a chain sufficiently long to enable the horse to shift his posture, or move in his stall; but even these must be taken off at night, otherwise the animal will seldom lie down.

QUIDDING.

A horse will sometimes partly chew his hay, and suffer it to drop from his mouth. If this does not proceed from irregular teeth, which it will be the business of the veterinary surgeon to rasp down, it will be found to be connected with sore-throat, and then the horse will exhibit some other symptom of indisposition, and the swallowing of water will be accompanied by a peculiar gulping effort. In this case the disease (catarrh, with sore throat) must be attacked, and the quidding will cease.

ROLLING.

This is a very pleasant and perfectly safe amusement for a horse at grass, but cannot be indulged in the stable without the chance of his being dangerously entangled with the collar rein, and being cast. Yet, although the horse is cast, and bruised, and half-strangled, he will roll again on the following night, and continue to do so as long as he lives. The only remedy is not a very pleasant one to the horse, nor always quite safe; yet it must be had recourse to if the habit of rolling is inveterate. 'The horse,' says Mr. Castley, in the *Veterinarian*, 'should be tied with length enough of collar to lie down, but not to allow of his head resting on the ground; because, in order to roll over, a horse is obliged to place his head quite down upon the ground.'

SHYING.

We have briefly treated of the cause of this vice at page 98, and observed that while it is often the result of cowardice, or playfulness, or want of work, it is at other times the consequence of a defect of sight. It has been remarked, and we believe very truly, that shying is oftener a vice of half or quarter-bred horses, than of those who have in them more of the genuine racing blood.

In the treatment of shying, it is of great importance to distinguish between that which is the consequence of defective sight, and that which results from fear, or newness of objects, or from mere affectation or skittishness. For the first, the nature of which we have explained at page 98, every allowance must be made, and care must be taken that the fear of correction be not associated with the imagined existence of some terrifying object. The severe use of the whip and the spur cannot do good here, and are likely to aggravate the vice tenfold. A word half encouraging and half scolding, with a gentle pressure of the heel, or a slight touch of the spur, will tell the horse that there was nothing to fear, and will give him confidence in his rider on a future occasion. It should be remembered, however, that although a horse that shies from defective sight may be taught considerable reliance on his rider, he can never have the cause of the habit removed. We may artificially strengthen the human sight, but the horse's must be left to itself.

The shying from skittishness or affectation is quite a different affair, and must be conquered: but how? Severity is out of place even here. If he is forced up to the object by dint of correction, the dread of punishment will afterwards be associated with that object, and on the next occasion, his startings will be more frequent and more dangerous. The way to cure him is to go on, turning as little as possible out of the road, giving the animal a harsh word or two, and a gentle touch with the spur, and then taking no more notice of the matter. After a few times, whatever may have been the object which he chose to select as the pretended cause of affright, he will pass it almost without notice.

In page 225, under the head 'breaking in,' we have described how the colt may be cured of the habit of shying from fear or newness of objects; and if he then be accustomed as much as possible to the objects among which his services will be required, he will not possess this annoying vice when he grows to maturer age.

Mr. John Lawrence, in his last pleasing work on the Horse, says, 'These animals generally fix on some particular shying butt: for example, I recollect having, at different periods, three hacks, all very powerful; the one made choice of a wind-mill for the object or butt, the other a tilted waggon, and the last a pig led in a string. It so happened, however, that I rode the two former when amiss from a violent cold, and they then paid no more attention to either windmills or tilted waggons than to any other objects, convincing me that their shying when in health and spirits was pure affectation; an affectation, however, which may be speedily united with obstinacy and vice. Let it be treated with marked displeasure, mingled with gentle, but decided firmness, and the habit will be of short endurance*.'

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* 'We will suppose a case, a very common one, an every-day one. A man is riding a young horse upon the high-road in the country, and meets a stage-coach. What with the noise, the bustle, the imposing appearance altogether, and the slashing of the coachman's whip, the animal at its approach erects his head and crest, pricks his ears, looks affrighted, and no sooner comes alongside of the machine than he suddenly starts out of the road. His rider, annoyed by this, instantly commences a round of castigation with whip, spur, and curb, in which he persists until the horse, as well as himself, has lost his temper; and then one whips, spurs, and pulls, and the other jumps, plunges, frets, and throws up his head, until both, pretty well exhausted by the conflict, grow tranquil again and proceed on their journey, though not for some time afterwards in their former mutual confidence and satisfaction. Should they in their road, or even on a distant day, meet with another coach, what is the consequence? That the horse is not only more alarmed than before; but now,

Shying on coming out of the Stable is a habit that can rarely or never be cured. It proceeds from the remembrance of some ill-usage or hurt which the animal has received in the act of proceeding from the stable, such as striking his head against a low door-way, or entangling the harness. Coercion will but associate greater fear and more determined resistance with the old recollection. Mr. Castley, to whom we are indebted for much that is valuable on the subject of the vices of the horse, gives an interesting anecdote, which tends to prove that while severity will be worse than useless, even kind treatment will not break a confirmed habit. ‘ I remember a very fine grey mare that had got into this habit, and never could be persuaded to go through a door-way without taking an immense jump. To avoid this, the servants used to back her in and out of the stable; but the mare happening to meet with a severe injury of the spine, was no longer able to back; and then I have seen the poor creature, when brought to the door, endeavouring to balance herself with a staggering motion upon her half-paralyzed hind extremities, as if making preparation and summoning up resolution for some great effort; and then, when urged, she would plunge headlong forward with such violence of exertion, as often to lose her feet, and tumble down “ altogether most pitiable to be seen.” This I merely mention,’ he continues, ‘ as one proof how inveterate the habits of horses are. They are evils, let it always be remembered, more easy to prevent than cure.’

SLIPPING THE COLLAR.

This is a trick at which many horses are so clever that scarcely a night passes without their getting loose. It is a very serious habit, for it enables the horse sometimes to gorge himself with food, to the imminent danger of staggers; or it exposes him, as he wanders about, to be kicked and injured by the other horses, while his restlessness will often keep the whole team awake. If the web of the halter, being first accurately fitted to his neck, is suffered to slip only one way, or a strap is attached to the halter and buckled round the neck, but not sufficiently tight to be of serious inconvenience, the power of slipping the collar will be taken away.

TRIPPING.

He must be a skilful practitioner or a mere pretender who promises to remedy this habit. If it arises from a heavy forehand, and the fore legs being too much under the horse, no one can alter the natural frame of the beast: if it proceeds from tenderness of the foot, grogginess, or old lameness, these ailments are seldom cured; and if it is to be traced to habitual carelessness and idleness, no whipping will rouse the drone. A known stumbler should never be ridden, or driven alone, by any one who values his safety or his life. A tight hand or a strong bearing-rein are precautions that should not be neglected, but they are generally of little avail; for the inveterate stumbler will rarely try to save himself, and this tight rein may sooner and farther precipitate the rider. If, after a trip, the horse suddenly starts forward, and endeavours to break into a canter, the rider or driver may be assured that others before him have fruitlessly endeavoured to remedy the nuisance.

If the stumbler has the foot kept as short and the toe pared as close as

the moment he has started, being conscious of his fault, and expecting chastisement, he jumps about in fearful agitation, making plunges to strike into a gallop, and attempting to run away. So that by this correction, instead of rendering his horse tranquil during the passage of a coach, the rider adds to the evil of shying that of subsequently plunging, and perhaps running away.’—The *Veterinarian*, by Messrs. Percival and Youatt, vol. i., p. 96.

safety will permit, and the shoe be rounded at the toe, or have that shape given to it which it naturally acquires in a fortnight from the action of such a horse, the animal may not stumble quite so much; or if the disease which produced the habit can be alleviated, some trifling good may be done, but in almost every case a stumbler should be got rid of, or put to slow and heavy work. If the latter alternative be adopted, he may trip as much as he pleases, for the weight of the load and the motion of the other horses will keep him upon his legs.

WEAVING.

This consists in a motion of the head, neck, and body, from side to side, like the shuttle of a weaver passing through the web, and hence the name which is given to this peculiar and incessant action. It indicates an impatient, irritable temper, and a dislike to the confinement of the stable; and a horse that is thus incessantly on the fret will seldom carry flesh, or be safe to ride or drive. There is no cure for it, but the close tying up of the animal, except at feeding time.

CHAPTER XX.

THE GENERAL MANAGEMENT OF THE HORSE.

This is a most important part of our subject, even as it regards the farmer, although there are comparatively few glaring errors in the treatment of the agricultural horse: but it comes more especially home to the gentleman, who is too often and too implicitly under the guidance of an idle, and ignorant, and designing groom.

We will arrange the most important points of general management under the following heads:

AIR.

A supply of pure air is necessary to the existence and health of man and beast. In some agricultural stables, the supply, if not too great, is carelessly and injudiciously admitted; for the wind blows in from every quarter, and beats directly upon the animal. When he has been well seasoned to this, it seems to do him little harm, except that he has an unthrifty coat, and is out of condition. The common error, however, is to exclude as much as possible every breath of air, and to have the atmosphere of the stable, hot, contaminated, and unwholesome. The effect of several horses being shut up in the same stable is to render the air unpleasantly hot. A person coming from without cannot breathe it many minutes without profuse perspiration. The horse stands hour after hour in it, and sometimes clothed; and then his covering is suddenly stripped off, and he is led into the open air, the temperature of which is thirty or forty degrees below that of the stable. Putting the humanity of the thing for a moment out of the question, we ask, must not the animal, thus unnaturally and absurdly treated, be subject to rheumatism, catarrh, and inflammation of the lungs? It has been replied, that the horse keeps himself warm by exercise while he is thus exposed, and that a man, using strong exertion, cares little about the quantity of clothing upon him. Is the horse constantly in motion after his great coat and all his body clothes have been stripped from him, and he has been turned out naked, when the mercury in the thermometer is below the freezing point? Does he not often stand, hour after hour, in the road or the street, while his owner is warming himself within, and this perhaps after every pore has been opened by a brushing gallop; and his susceptibility to the painful and the injurious influence of cold has been excited to the utmost?

It is not so generally known as it ought to be, that the return to a hot stable is quite as dangerous as the change from a heated atmosphere to a cold and biting air. Many a horse, that has travelled without harm over a bleak country, has been suddenly seized with inflammation and fever when he has, immediately at the end of his journey, been surrounded with heated and foul air. It is the sudden change of temperature, whether from heat to cold, or from cold to heat, that does the mischief, and yearly destroys a multitude of horses.

The stable should be as large, compared with the number of horses which it is destined to contain, as circumstances will allow. A stable for six horses should not be less than forty feet in length, and thirteen or fourteen feet wide. If there be no loft above, the inside of the roof should always be plastered, to prevent direct currents of air and occasional droppings from broken tiles; and the heated and foul air should escape, and cool and pure air be admitted, by elevation of the central tiles; or by large tubes carried through the roof, with caps a little above them to prevent the beating in of the rain; or by gratings placed high up in the walls. These latter apertures should be as far above the horses as they can conveniently be placed, by which means all injurious draught will be prevented.

If there is a loft above the stable, the ceiling should be plastered in order to prevent the foul air from penetrating to the hay above, and injuring both its taste and its wholesomeness; and no openings should be allowed above the racks, through which the hay may be thrown into the rack, for they also will permit the foul air to ascend to the provender, and, in the act of filling the rack, and while the horse is eagerly gazing upward for his food, many a grass-seed has fallen into his eye, and produced considerable inflammation; while at other times, when the careless groom has left open the trap-door, a stream of cold air beats down on the head of the horse.

The stable with a loft over it should never be less than twelve feet high, and proper ventilation should be secured either by tubes carried up through the loft to the roof, or by gratings close to the ceiling. These gratings or openings should be enlarged or contracted by means of a covering or shutter, so that during spring, summer, and autumn, the stable should possess nearly the same temperature with the open air, and, in winter, a temperature not more than ten degrees above that of the external atmosphere. A hot stable has, in the mind of the groom, been long connected with a glossy coat. The latter, it is thought, cannot be attained without the former. To this we should reply that, in winter, a thin, glossy coat is not desirable. Nature gives to every animal a warmer clothing when the cold weather approaches. The horse acquires a thicker and a lengthened coat, in order to defend him from the surrounding cold. Man puts on an additional and a warmer covering, and his comfort is increased and his health preserved by it. He who knows anything of the horse, or cares anything for his enjoyment, will not object to a coat a little longer and a little roughened, when the wintry wind blows bleak. The coat, however, need not be so long as to be unsightly; and warm clothing, even in a cool stable, will, with plenty of honest grooming, keep the hair sufficiently smooth and glossy to satisfy the most fastidious. The over-heated air of a close stable saves much of this grooming, and therefore the idle attendant unscrupulously sacrifices the health and safety of the horse.

If the stable is close, the air will not only be hot, but foul. The breathing of every animal contaminates it; and when, in the course of the night, with every aperture, even the key-hole, stopped, it passes again and again through the lungs, the blood cannot undergo its proper and healthy change; digestion cannot be so perfectly performed, and all the functions of life are injured. Let the owner of the valuable horse think of his passing twenty or twenty-two out of the twenty-four hours in this debilitating atmosphere. Nature does wonders in enabling every animal to accommodate itself to the situation in which it is placed, and the horse that lives in the stable-oven suffers less from it than would scarcely be conceived possible; but he does not, and cannot, possess the power and the hardihood which he would acquire under other circumstances.

The air of the improperly close stable is still further contaminated by the urine and dung, which rapidly ferment in the heat, and give out stimulating and unwholesome vapours. When a person first enters an ill-managed stable, and especially early in the morning, he is annoyed not only by the heat of the confined air, but by a pungent smell, resembling hartshorn; and can he wonder at the inflammation of the eyes, and the chronic cough, and the inflammation of the lungs, with which the animal, who has been shut up in this vitiated atmosphere all night, is often attacked; or if glanders and farcy should occasionally break out in such stables? It has been ascertained by chemical experiment, that the urine of the horse contains in it an exceedingly large quantity of hartshorn; and not only so, but that, influenced by the heat of a crowded stable, and possibly by other decompositions that are going forward at the same time, this ammoniacal vapour begins to be rapidly given out almost immediately after the urine is voided.

When disease begins to appear among the inhabitants of these ill-ventilated places, is it wonderful that it should rapidly spread among them, and that the plague-spot should be, as it were, placed on the door of such a stable? When distemper appears in spring or in autumn, it is in very many cases to be traced first of all to such a pest-house. It is peculiarly fatal there. The horses belonging to a small establishment, and rationally treated, have it comparatively seldom, or have it lightly; but, among the inmates of a crowded stable, it is sure to display itself, and there it is most of all fatal. The experience of every veterinary surgeon, and of every large proprietor of horses, will corroborate this statement. Agriculturists should bring to their stables the common sense which directs them in the usual concerns of life; and should begin, when their pleasures and their property are so much at stake, to assume that authority, and to enforce that obedience, to the lack of which is to be attributed the greater part of bad stable-management and horse-disease. Of nothing are we more certain, than that the majority of the maladies of the horse, and those of the worst and most fatal character, are directly or indirectly to be attributed to the unnatural heat of the stable, and the sudden change of the animal from a high to a low, or from a low to a high temperature.

LITTER.

Having spoken of the vapour of hartshorn, which is so rapidly and so plentifully given out from the urine of a horse in a heated stable, we take next into consideration the subject of litter. The first caution is frequently to remove it. The early extrication of gas shews the rapid putrefaction of the urine; and the consequence of which will be the rapid putrefaction of the litter that has been moistened by it. Everything hastening to decomposition should be carefully removed where life and health are to be preserved. Every portion of the litter that has been much wetted, or at all softened by the urine, and is beginning to decay, should be swept away every morning: the greater part of the remainder may then be piled under the manger, a little being left to prevent the painful and injurious pressure of the feet on the hard pavement during the day. The soiled and macerated portion of that which was left should be removed at night.

No heap of fermenting dung should be suffered to remain during the day in the corner or in any part of the stable. With regard to this, the directions of the master should be peremptory.

The stable should be so contrived that the urine shall quickly run off, and the offensive and injurious vapour from the decomposing urine and the litter will thus be materially lessened: if, however, the urine be carried away by means of a gutter running along the stable, the floor of the stalls must slant toward that gutter, and the declivity will sometimes be so great as to strain the back sinews, and become an occasional, although unsuspected cause of lameness. Mr. R. Lawrence well observes that 'if the reader will stand for a few minutes with his toes higher than his heels, the pain he will feel in the calves of his legs will soon convince him of the truth of this remark. Hence, when a horse is not eating, he always endeavours to find his level, either by standing across the stall, or else as far back as his halter will permit, so that his hind legs may meet the ascent of the other side of the channel.'

This direction of the stall is also a frequent cause of contraction of the heels of the foot, by throwing too great a proportion of the weight upon the toe, and removing that pressure on the heels which tends most to keep them open. Care therefore must be taken that the slanting of the floor of the stalls shall be no more than is sufficient to drain off the urine with tolerable rapidity. Stalls of this kind certainly do best for mares; but for horses we much prefer those with a grating in the centre, and an inclination of the floor on every side towards the middle. A short branch may communicate with a larger drain, by means of which the urine may be carried off to a reservoir outside the stable. Traps are now contrived, and may be procured at little expense, by means of which neither any offensive smell nor current of air can pass through the grating.

The farmer should not lose any of the urine. It is from the dung of the horse that he derives a principal and the most valuable part of his manure. It is that which earliest takes on the process of putrefaction, and forms one of the strongest and most durable dressings. That which is most of all concerned with the rapidity and the perfection of the decomposition, is the urine.

The reasons why the horse should always stand on litter have been given at page 295. Humanity and interest, as well as the appearance of the stable, will induce the general proprietor of the horse to place a moderate quantity of litter under him during the day. The farmer who wants to convert every otherwise useless substance into manure will have additional reason for adopting this practice; especially as he does not confine himself to that to which in towns and in gentlemen's stables custom seems to have limited the bed of the horse. Pea and bean-haum, and potatoe-top, and heath, occupy in the stable of the farmer, during a part of the year, the place of wheaten and oaten straw. It should, however, be remembered, that these substances are disposed more easily to ferment and putrefy than straw, and therefore should be more carefully examined, and oftener removed. It is the faulty custom of some farmers to let the bed accumulate until it reaches almost to the horse's belly, and the bottom of it is a mass of dung. If there were not often many a hole and cranny through which the wind can enter, and disperse the foul air, the health of the animal would suffer.

LIGHT.

This neglected branch of stable-management is of far more consequence than is generally imagined; and it is particularly neglected by those for whom these treatises are principally designed. The farmer's stable is frequently destitute of any glazed window; and has only a shutter, which is raised in warm, and shut down in cold, weather. When the horse is in the stable only during a few hours of the day, this is not of so much consequence; nor of so much, probably, to horses of slow work; but to carriage horses and hackneys, so far at least as the eyes are concerned, a dark stable is little less injurious than a foul and heated one. To illustrate this, reference may be made to the unpleasant feeling and the utter impossibility of seeing distinctly, when a man suddenly emerges from a dark place into the full blaze of day. The sensation of mingled pain and giddiness is not soon forgotten; and some minutes pass before the eye can accommodate itself to the increased light. If this were to happen every day, or several times in the day, the sight would be irreparably injured; or, possibly, blindness would ensue. Can we wonder, then, that the horse taken from a dark stable into a glare of light, and feeling, probably, as we should do under similar circumstances, and unable or a considerable time to see anything around him distinctly, should become a starter, or that the frequently repeated violent effect of sudden light should induce inflammation of the eye, so intense as to terminate in blindness? There is, indeed, no doubt that horses kept in a dark stable are frequently notorious starters, and that starting has been evidently traced to this cause.

Farmers know, and should profit by the knowledge, that the darkness of the stable is not unfrequently a cover for great uncleanliness. A glazed window, with leaden divisions between the small panes, would not cost much, and would admit a degree of light somewhat more approaching to that of day; and, at the same time, would render the concealment of gross inattention and want of cleanliness impossible.

If plenty of light be admitted, the walls of the stable, and especially that portion of them which is before the horse's head, must not be of too glaring a colour. The constant reflection from a white wall, and especially if the sun shines into the stable, will be as injurious to the eye as the sudden changes from darkness to light. The perpetual slight excess of stimulus will do as much mischief as the occasional, but more violent one, when the animal is taken from a kind of twilight to the blaze of day. The colour of the stable, therefore, should depend on the quantity of light. Where much can be admitted, the walls should be of a grey hue. Where darkness would otherwise prevail, frequent whitewashing may in some degree dissipate the gloom.

For another reason it will be evident that the stable should not possess too glaring a light. It is the resting-place of the horse. The work of the farmer's horse, indeed, is confined principally to the day, but the labours of others are demanded at all periods. The hour of exertion having passed, the animal returns to his stable to feed and to repose, and the latter is as necessary as the former, in order to prepare him for renewed work. Something approaching to the dimness of twilight is requisite, to induce the animal to compose himself to sleep. This half-light more particularly suits horses of heavy work, and who draw almost as much by the weight of carcass which they can throw into the collar, as by the degree of muscular energy of which they are capable. In the quietness of a dimly-lighted stable they obtain repose, and accumulate flesh and fat. Dealers are perfectly aware of this. They have their darkened stables, in which the young horse, with little or no exercise, and fed upon mashes and ground corn, is made up for sale. The round and plump appearance, however, which may delude the unwary, soon vanishes with altered treatment, and the animal is found to be unfit for hard work, and predisposed to every inflammatory disease. The circumstances, then, under which a stable somewhat darkened may be allowed, will be easily determined by the owner of the horse; but, as a general rule, dark stables are unfriendly to cleanliness, and the frequent cause of the vice of starting, and of the most serious diseases of the eyes.

GROOMING.

Of this much need not be said, since custom, and, apparently without ill effect, has allotted so little of the comb and the brush to the farmer's horse. The animal that is worked all day, and turned out at night, requires little more to be done to him than to have the dirt brushed off his limbs. Regular grooming, by rendering his skin more sensible to the alteration of temperature, and the inclemency of the weather, would be prejudicial. The horse that is altogether turned out needs no grooming. The dandriff or scurf which accumulates at the roots of the hair is a provision of nature to defend him from the wind and the cold.

It is to the stabled horse, highly fed, and little or irregularly worked, that grooming is of so much consequence. Good rubbing with the brush or the currycomb *opens the pores of the skin*, and circulates the blood to the extremities of the body and through the minute vessels of the skin, and produces free and healthy perspiration, and stands in the room of exercise. No horse will carry a fine coat without either heat or dressing. They both effect the same purpose; they both increase the insensible perspiration: but the first does it at the expense of health and strength, while the second, at the same time that it produces a glow on the skin, and a determination of blood to it, rouses all the energies of the frame. It would be well for the proprietor of the horse if he were to insist upon it, and to see that his orders are really obeyed, that the fine coat in which he and his groom so much delight, is produced by honest rubbing, and not by a heated stable and thick clothing, and most of all, not by stimulating or injurious spices.

When the weather will permit the horse to be taken out, he should never be groomed in the stable. Without dwelling on the want of cleanliness, when the scurf and dust that are brushed from the horse lodge in his manger, and mingle with his food, experience teaches, that if the cold is not too great, the animal is braced and invigorated from being dressed in the open air, to a degree that cannot be attained in the stable. There is no necessity, however, for half the punishment which many a groom inflicts upon the horse in the act of dressing; and particularly on one whose skin is thin and sensible. The currycomb should at all imes be lightly applied. With many horses its use may be almost dispensed with; and even the brush need not be so hard, nor the points of the bristles so irregular as they often are. A soft brush, with a little more weight of the hand, will be equally effectual, and a great deal more pleasant to the horse. A hair cloth, while it will seldom irritate and tease, will be almost sufficient with horses that have thin hair, and that have not been neglected.

Whoever would be convinced of the benefit of friction to the horse's skin, and to the horse generally, need only observe the effect produced by well hand-rubbing the legs of a tired horse. While every enlargement subsides, and the painful stiffness disappears, and the legs attain their natural warmth, and become fine, the animal is evidently and rapidly reviving; he attacks his food with appetite, and then quietly lies down to rest.

EXERCISE.

Our observations on this important branch of stable-management must have only slight reference to the agricultural horse. His work is usually regular and not exhausting. He is neither predisposed to disease by idleness, nor worn out by excessive exertion. He, like his master, has enough to do to keep him in health, and not enough to distress or injure him: on the contrary, the regularity of his work prolongs life to an extent rarely witnessed in the stable of the gentleman. Our remarks on exercise, then, must have a general bearing, or have principal reference to those persons who are in the middle stations of life, who contrive to keep a horse for business or pleasure, but cannot afford to maintain a servant for the express purpose of looking after it. The first rule we would lay down is, that every horse should have daily exercise. The horse that, with the usual stable feeding, stands idle for three or four days, as is the case in many establishments, must suffer. He is disposed to fever, or to grease, or, most of all, to diseases of the foot; and if, after these three or four days of inactivity, he is ridden fast and far, is almost sure to have inflammation of the lungs or of the feet.

A gentleman or tradesman's horse suffers a great deal more from idleness than he does from work. A stable-fed horse should have two hours' exercise every day, if he is to be kept free from disease. Nothing of extraordinary or even of ordinary labour can be effected on the road or in the field without sufficient and regular exercise. It is this alone which can give energy to the system, or develop the powers of any animal.

How then is this exercise to be given? As much as possible by, or under the superintendence of, the owner. The exercise given by the groom is rarely to be depended upon. It is inefficient, or it is extreme. It is in many cases both irregular and injurious. It is dependent on the caprice of him who is performing a task, and who will render that task subservient to his own pleasure or purposes.

In training the hunter and the race-horse regular exercise is the most important of all considerations, however it may be forgotten in the usual management of the stable. The exercised horse will discharge his task, and sometimes a severe one, with ease and pleasure, while the idle and neglected one will be fatigued ere half his labour be accomplished, and if he be pushed a little too far, dangerous inflammation will ensue. How often, nevertheless, does it happen, that the horse that has stood inactive in the stable three or four days, is ridden or driven thirty or forty miles in the course of a single day? This rest is often purposely given to prepare for extra-exertion;—to lay in a stock of strength for the performance of the task required of him: and then the owner is surprised and dissatisfied if the animal is fairly knocked up, or possibly becomes seriously ill. Nothing is so common and so preposterous, as for a person to buy a horse from a dealer's stable, where he has been idly fattening for sale for many a day, and immediately to give him a long run after the hounds, and complain bitterly, and think that he has been imposed upon, if the animal is exhausted before the end of the chase, or is compelled to be led home suffering from violent inflammation. Regular and gradually increasing exercise would have made the same horse appear a treasure to his owner.

Exercise should be somewhat proportioned to the age of the horse. A young horse requires more than an old one. Nature has given to young animals of every kind a disposition to activity; but the exercise must not be violent. A great deal depends upon the manner in which it is given. To preserve the temper, and to promote health, it should be moderate, at least at the beginning and the termination. The rapid trot, or even the gallop, may be resorted to in the middle of the exercise, but the horse must be brought in cool. If the owner would seldom intrust his horse to boys, and would insist on the exercise being taken within sight, or in the neighbourhood of his residence, many an accident and irreparable injury would be avoided. It should be the owner's pleasure, and is his interest, personally to attend to all these things. He manages every other part of his concerns, and he may depend on it, that he suffers when he neglects, or is in a manner excluded from his stables.

FOOD.

The system of manger-feeding is becoming general among farmers. There are few horses that do not habitually waste a portion of their hay; and by some the greater part is pulled down and trampled under foot, in order first to cull the sweetest and best locks, and which could not be done while the hay was inclosed in the rack. A good feeder will afterwards pick up much of that which was thrown down; but some of it must be soiled and rendered disgusting, and, in many cases, one-third of this division of their food is wasted. Some of the oats and beans are imperfectly chewed by all horses, and scarcely at all by hungry and greedy ones, The appearance of the dung will sufficiently evince this.

The observation of this induced the adoption of manger-feeding, or of mixing a portion of chaff with the corn and beans. By this means the animal is compelled to chew his food; he cannot, to any great degree, bolt the straw or hay; and while he is forced to grind that down, the oats and beans are ground with it, and yields more nourishment; the stomach is more slowly filled, and therefore acts better on its contents, and is not so likely to be overloaded; and the increased quantity of saliva thrown out in the lengthened grinding of the food, softens it, and renders it more fit for digestion.

If, when considerable provender was wasted, the horse maintained his condition, and was able to do his work, it was evident that much might be saved to the farmer, when he adopted a system by which the horse ate all that was set before him; and by degrees it was found out that even food somewhat less nutritious, but a great deal cheaper, and which the horse either would not eat, or would not properly grind down, in its natural state, might be added, while the animal would be in quite as good plight, and always ready for work.

Chaff may be composed of equal quantities of clover or meadow hay, and wheaten, oaten, or barley straw, cut into pieces of a quarter or half an inch in length, and mingled well together; the allowance of oats or beans is afterwards added, and mixed with the chaff. Many farmers very properly bruise the oats or beans. The whole oat is apt to slip out of the chaff and be lost; but when it is bruised, and especially if the chaff is a little wetted, it will not readily separate; or, should a portion of it escape the grinders, it will be partly prepared for digestion by the act of bruising. The prejudice against bruising the oats is, so far as the farmer's horse, and the waggon horse, and every horse of slow draught is concerned, altogether unfounded. The quantity of straw in the chaff will always counteract any supposed purgative quality in the bruised oats. Horses of quicker draught, except they are naturally disposed to scour, will thrive better with bruised than with whole oats; for a greater quantity of nutriment will be extracted from the food, and it will always be easy to apportion the quantity of straw or beans to the effect of the mixture on the bowels of the horse. The principal alteration that should be made in the horse of harder and more rapid work, such as the post-horse, and the stage-coach horse, is to increase the quantity of hay, and diminish that of straw. Two trusses of hay may be cut with one of straw.

Some gentlemen, in defiance of the prejudice and opposition of the coachman or the groom, have introduced this mode of feeding into the stables of their carriage horses and hackneys, and with manifest advantage. There has been no loss of condition or power, and considerable saving of provender. This system is not, however, calculated for the hunter or the race horse. Their food must be in smaller bulk, in order that the action of the lungs may not be impeded by the distention of the stomach; yet many hunters have gone well over the field, who have been manger-fed, the proportion of corn, however, being materially increased.

For the agricultural and cart horse, eight pounds of oats and two of beans should be added to every twenty pounds of chaff; and thirty-four or thirty-six pounds of the mixture will be sufficient for any moderate-sized horse, with fair, or even hard work. The dray and waggon-horse may require forty pounds. Hay in the rack at night is, in this case, supposed to be omitted altogether. The rack, however, may remain, as occasionally useful for the sick horse, or to contain tares or other green meat.

In order to prevent some horses from turning much of the chaff out of the manger in their search for the oats, small iron bars may be placed across it, and the provender plentifully sprinkled with water, but the water should be applied only at the time of feeding, for the wetted mixture would soon become sour and mouldy.

Horses are very fond of this provender. The majority of them, after having been accustomed to it, will leave the best oats given to them alone, for the sake of the mingled chaff and corn. We would, however, caution the farmer not to set apart too much damaged hay for the manufacture of the chaff. The horse may be thus induced to eat that which he would otherwise refuse; but if the nourishing property of the hay has been impaired, or it has acquired an injurious principle, the horse will either lose condition, or become diseased. More injury is done by the eating of damaged hay or musty oats than is generally imagined. There will be sufficient saving in the diminished cost of the provender by the introduction of the straw, and in the improved condition of the horse, without poisoning him with the refuse of the farm.

While the mixture of chaff with the corn prevents the corn from being too rapidly devoured, and a portion of it swallowed whole, and therefore the stomach is not too loaded with that on which, as containing the most nutriment, its chief digestive power should be exerted, yet, on the whole, a great deal of time is gained by this mode of feeding, and more is left for rest. When a horse comes in wearied at the close of the day, it occupies, after he has eaten his corn, two or three hours to clear his rack. On the system of manger-feeding, the chaff being already cut into small pieces, and the beans and oats bruised, he is able fully to satisfy his appetite in an hour and a half. Two additional hours are therefore devoted to rest. This is a circumstance deserving of much consideration even in the farmer's stable, and of immense consequence to the postmaster, the stagecoach proprietor, and the owner of every hard-worked horse.

Manger food will be the usual support of the farmer's horse during the winter, and while at constant or occasional hard work; but from the middle or end of April to the end of July, he may be fed with this mixture in the day, and turned out at night, or he may remain out during every rest day: a team in constant employ should not, however, be suffered to be out at night, after the end of July.

The farmer should take care that the pasture is thick and good; and that the distance from the yard is not too great, nor the fields too large, otherwise a very considerable portion of time will be occupied in catching the horses in the morning. He will likewise have to take into consideration the sale he would have for his hay, and the necessity for sweet and untrodden pasture for his cattle. On the whole, however, turning out in this way, when circumstances will admit of it, will be found to be more beneficial for the horse, and cheaper than soiling in the yard.

The small farmer's horse is sometimes fed on hay or grass alone, and the animal, although he rarely gets a feed of corn, maintains himself in tolerable condition, and does the work that is required of him; but hay and grass alone, however good in quality, or in whatever quantity administered, will not support the horse under hard work; and therefore other substances, containing a larger proportion of nutriment in a smaller compass, have been added. We will briefly enumerate them, and consider their comparative value. In almost every part of Great Britain, the OAT has been selected as that portion of the food which is to afford the principal nourishment. It contains seven hundred and forty-three parts out of a thousand of nutritive matter. The oat should be old, heavy, dry, and sweet. The new oat will weigh ten or fifteen per cent. more than the old oat; but the difference consists principally in watery matter, which is gradually evaporated. The new oat is not so readily ground down by the teeth as the old one, and forms a more glutinous mass, difficult to digest, and, when eaten in considerable quantities, is apt to occasion colic and even staggers. The old oat forms, when chewed, a smooth and uniform mass, which readily dissolves in the stomach, and yields the nourishment which it contains, and perhaps some chemical change may have been slowly effected in the old oat, disposing it to be more readily assimilated. Oats should be plump, bright in colour, and free from unpleasant smell or taste. The musty smell of wetted or damaged corn is caused by a fungus which grows upon the seed, and which has an injurious effect on the urinary organs, and often on the intestines, producing profuse staling, inflammation of the kidney or colic, and inflammation of the bowels.

This musty smell is removed by kiln-drying the oat, but care is here requisite that too great a degree of heat is not employed. It should be sufficient to destroy the fungus without injuring the life of the seed. The kiln-burnt oat, however, is not so grateful to the animal: it acquires a heating quality—causes increased discharge of urine, and not unfrequently produces inflammation of the eyes, and mangy affections of the skin.

Of the quantity of oats in the chaff we have already spoken. An improvement would be effected, by cutting the unthreshed oat straw into chaff. The expense of threshing would be saved. Oat straw is better than barley straw, but does not contain so much nourishment as that of wheat.

When the horse is fed on hay and oats, the quantity of the oats must vary with his size and the work to be performed. In winter, four feeds, or nine or ten pounds of oats a day, will be a fair allowance for a horse of fifteen hands one or two inches high, and that has moderate work. In summer, half the quantity, with green food, will be sufficient.

Oatmeal will form a poultice, more stimulating than one composed of linseed meal alone—or they may be mingled in different proportions as circumstances may require. In the form of gruel it constitutes one of the most important articles of diet for the sick horse—not indeed forced upon him, but a pail containing it being slung in his box, and of which he will soon begin to drink when water is denied. In cases of poisoning, or of over purging, it is useful whether administered by the mouth, or as an injection.

White-water, made by stirring a pint of oatmeal into a pail of water, the chill being taken from it, is an excellent beverage for the thirsty and tired horse.

Barley is a common food of the horse on various parts of the Continent, and, until the introduction of the oat, seems to have constituted almost his only food. It is more nutritious than oats, containing nine hundred and twenty parts of nutritive matter in every thousand. There seems, however, to be something necessary besides a great proportion of nutritive matter, in order to render any substance wholesome, strengthening, or fattening. Except where horses are very hardly worked, barley does not seem in our country to agree with them so well as oats. They are more subject to inflammatory complaints, and particularly to surfeit and mange. When barley is given, the quantity should not exceed a peck daily. It should be always bruised, and the chaff should consist of equal quantities of hay and barley-straw, and not cut too short. If the farmer has a quantity of spotted or unsaleable barley which he wishes thus to get rid of, he must very gradually accustom his horses to it, or he will probably produce serious illness among them. For horses that are recovering from illness, barley, in the form of malt, is often serviceable, as tempting the appetite and recruiting the strength. It is best given in mashes; water, considerably below the boiling heat, being poured upon it, and the vessel or pail kept covered for half an hour.

Grains fresh from the mash-tub, either alone, or mixed with oats or chaff, or both, may be occasionally given to horses of slow work; they would, however, afford very insufficient nourishment for horses of quicker or harder work.

Wheat is in Great Britain more rarely given than barley. It contains nine hundred and fifty-five parts of nutritive matter. When farmers have a damaged or unmarketable sample of wheat, they sometimes give it to their horses, and, being at first used in small quantities, the horse becomes accustomed to it, and thrives and works well. It must, however, always be bruised and given in chaff. Wheat contains a greater proportion of *gluten*, or sticky adhesive matter, than any other kind of grain; it is difficult of digestion, and apt to cake and form obstructions in the bowels. This will oftener be the case if the horse is suffered to drink much water soon after feeding upon wheat; for the water passing rapidly through the stomach and small intestines, in its way to the cœcum, (see page 204,) carries off with it all the starch, which is the most nourishing, and leaves this sticky mass behind, which accumulates and hardens, and obstructs the intestines, and often destroys the horse. A horse that is fed on wheat should have very little hay. The proportion should not be more than one truss of hay to two of straw. Wheaten flour, boiled in water to the thickness of starch, is given with good effect in over purging, and especially if combined with chalk and opium.

Beans.—These form a striking illustration of the principle, that the nourishing or strengthening effects of the different articles of food depend more upon some peculiar property which they have, or some combination which they form, than on the actual quantity of nutritive matter. Beans contain but five hundred and seventy parts of nutritive matter, yet they add materially to the vigour of the horse. There are many horses that will not stand hard work without beans being mingled with their food, and these not horses whose tendency to purge it may be necessary to restrain by the astringency of the bean. There is no traveller who is not aware of the difference in the spirit and continuance of his horse if he allows or denies him beans on his journey. They afford not merely a temporary stimulus, but they may be daily used without losing their power, or producing exhaustion. Two pounds of beans may, with advantage, be mixed with the chaff of the agricultural horse, during the winter. In summer, the quantity may be lessened, or the beans altogether discontinued. Beans are generally given whole. This is very absurd ; for the young horse, whose teeth are strong, seldom requires them ; while the old horse, to whom they are in a manner necessary, is scarcely able to masticate them, swallows many of them whole which he is unable to break, and drops much corn from his mouth in the ineffectual attempt to break them. Beans should not be merely split, but crushed ; they will even then give sufficient employment to the grinders of the animal. Some postmasters use chaff with beans instead of oats. With hardly-worked horses they may possibly be allowed ; but in general cases, the beans, without oats, would be too binding and stimulating, and would produce costiveness, and probably megrims or staggers.

Peas are occasionally given. They appear to be in a slight degree more nourishing than beans, and not so heating. They contain five hundred and seventy-four parts of nutritive matter. For horses of slow work they may be used ; but the quantity of chaff should be increased, and a few oats added. They have not been found to answer with horses of quick draught. It is essential that they should be crushed ; otherwise on account of their globular form, they are apt to escape from the teeth, and many are swallowed whole. Exposed to warmth and moisture in the stomach, they swell very much, and may painfully and injuriously distend it.

Many horses have died after gorging themselves with peas, and the stomach has been found to have been burst by their swelling. If a small phial is filled with peas, and warm water poured on them, and the bottle tightly corked, it will burst in a few hours.

Herbage, green and dry, constitutes a principal part of the food of the horse. There are few things with regard to which the farmer is so careless as the mixture of grasses on both his upland and meadow pasture. Hence we find, in the same field, the ray grass, coming to perfection only in a loamy soil, not fit to cut until the middle or latter part of July, and yielding little aftermath ; the meadow fox-tail, best cultivated in a clayey soil, fit for the scythe in the beginning of June, and yielding a plentiful aftermath ; the glaucous fescue grass, ready at the middle of June, and rapidly deteriorating in value as its seeds ripen ; and the fertile meadow grass, increasing in value until the end of July. These are circumstances the importance of which will, at no distant period, be recognised. In the mean time, Sinclair's account of the different grasses, or the condensation of the most important part of his work in Sir Humphry Davy's Agricultural Chemistry, are well deserving of the diligent perusal of the farmer.

Were there not too many proofs that the very refuse of the farm is often devoted to the keep of the agricultural horse, it would be needless to repeat that the animal that works constantly and hard should have the best food, and plenty of it. Old hay, as having longer undergone that slow process of fermentation by which the sugar that it contains is developed, is far more nutritive and wholesome than new hay. *Mowburnt* hay is more injurious to horses than to any other of the domestic animals, and is a fruitful source of disease.

Where the manger system of feeding is not adopted, or where hay is still given at night, and chaff and corn in the day, there is no error into which the farmer is so apt to fall as to give an undue quantity of hay, and that generally of the worst kind. If the manger system is good, there can be no necessity for hay, or only for a small quantity of it; but if the rack is overloaded, the greedy horse will be eating all night, instead of taking his rest; and when the time for the morning feed arrives, his stomach will be already filled, and he will be less capable of work, from the want of sleep, and from the long-continued distention of the stomach rendering it impossible for the food to be properly digested.

It is a good practice to sprinkle the hay with water in which salt has been dissolved. It is evidently more palatable to the animal, who will have the best unsalted hay for that of an inferior quality that has been moistened with brine; and there can be no doubt that the salt very materially assists the process of digestion. The preferable way of salting the hay would be to sprinkle it over the different layers as the rick is formed. From its attraction for water, it would combine with that excess of moisture which, in wet seasons, is the cause of too rapid and violent fermentation, and of the hay becoming mowburnt, or the rick sometimes catching fire, and it would become more incorporated with the hay. The only objection to its being thus used is, that the colour of the hay is not so bright; but this would be of little consequence for home consumption.

Of the value of TARES, as forming a portion of the late spring and summer food of the stabled and agricultural horse, there can be no doubt. They are very nutritive, and they act as a kind of medicine. When surfeit-lumps appear on the skin, and the horse begins to rub himself against the divisions of the stall, and the legs swell, and the heels threaten to crack, a few tares, cut up with the chaff, or given instead of a portion of the hay, will often afford immediate and perfect relief. Ten or twelve pounds may be given daily, and half that weight of hay subtracted. It is an erroneous notion, that, given in moderate quantities, they either roughen the coat or lessen the capability for hard work.

RYE GRASS affords a valuable article of food, but is inferior to the tare. It is not so nutritive; it is apt to scour; and occasionally, and late in the spring, it has appeared to become injurious to the horse.

CLOVER, for soiling the horse, is inferior to the tare and the rye grass, but, nevertheless, is useful when they cannot be obtained. Clover hay is, perhaps, preferable to meadow hay for chaff; it will sometimes tempt the sick horse, and may be given with advantage to those of slow and heavy work; but custom seems properly to have forbidden it to the hunter and the hackney.

LUCERN, where it can be obtained, is preferable even to tares, and SAINT-FOIN is superior to lucern. Although they contain but a small quantity of nutritive matter, that is easily digested, and perfectly assimilated; they speedily put both muscle and fat on the horse that is worn down by labour, and they are almost a specific for hide-bound. Some farmers have thought so highly of lucern as to substitute it for oats. This may do for the agricultural horse of slow and not hard work; but he from whom speedier action is sometimes required, and the horse of all work, must have a proportion of hard meat within him.

THE SWEDISH TURNIP is an article of food the value of which has not been sufficiently appreciated, and particularly for agricultural horses. Although it is far from containing the quantity of nutritive matter which has been supposed, that, like the nutriment of the saint-foin and the lucern, seems to be capable of easy and complete digestion. It should be sliced with chopped straw, and without hay. Thirty pounds of the turnip, with two or three quarterns of oats, and six pounds of straw, will be sufficient for a horse of moderately hard work. Hackneys have been kept on them with a less quantity of oats.

CARROTS.—The virtues of this root are not sufficiently known, whether as contributing to the strength and endurance of the healthy horse, or the rapid recovery of the sick one. To the healthy horse they should be given sliced in his chaff. Half a bushel will be a fair daily allowance, and the two pounds of beans, and three pounds of the oats, may be withdrawn. There is little provender of which the horse is fonder. Some farmers allow a bushel of carrots with chaff, and without any oats; and the horses are said to be equal to all agricultural or slow work.

POTATOES have been given, and with advantage, in their raw state, sliced with the chaff; but, where it has been convenient to boil or steam them, the benefit has been far more evident. Some have given boiled potatoes alone, and horses, instead of rejecting them, have soon preferred them even to the oat; but it is better to mix them with the usual manger feed, in the proportion of one pound of potatoes to two and a half pounds of the other ingredients. The use of the potato must depend on its cheapness, and the facility for boiling it. Half a dozen horses would soon repay the expense of a steaming boiler in the saving of provender, without taking into the account their improved condition and capability for work. A horse fed on potatoes should have his quantity of water materially curtailed.

FURZE has sometimes been given during the winter months. There is considerable trouble attending the preparation of it, although its plentifulness and little value for other purposes would, on a large farm, well repay that trouble. The furze is cut down at about three or four years' growth; the green branches of that and the preceding year are cut off, and bruised in a mill, and then given to the horses in the state in which they come from the mill, or cut up with the chaff. Horses are very fond of it. If twenty pounds of the furze be given, five pounds of straw, the beans, and three pounds of the oats, may be withdrawn.

It may not be uninteresting to conclude this catalogue of the different articles of horse food with a list of the quantities of nutritive matter contained in each of them; for although these quantities cannot be considered as expressing the actual value of each, because other circumstances besides the simple quantity of nutriment seem to influence their effect in supporting the strength and condition of the horse, yet many a useful hint may be derived when the farmer looks over the produce of his soil, and inquires what other grasses or vegetables might suit his soil. The list is partly taken from Sir Humphry Davy's Agricultural Chemistry:—1000 parts of wheat contain 955 parts of nutritive matter; barley, 920; oats, 743; peas, 574; beans, 570; potatoes, 230; red beet, 148; parsnips, 99; carrots, 98. Of the grasses, 1000 parts of the meadow cat's tail contain at the time of seeding 98 parts of nutritive matter; narrow-leaved meadow grass in seed, and sweet-scented soft grass in flower, 95; narrow-leaved and flat-stalked meadow grass in flower, fertile meadow grass in seed, and tall fescue, in flower, 93; fertile meadow grass, meadow fescue, reed-like fescue, and creeping soft grass in flower, 78; sweet-scented soft grass in flower, and the aftermath, 77; fiorin, cut in winter, 76; tall fescue, in the aftermath, and meadow soft grass in flower, 74; cabbage, 73; crested dog's tail and brome flowering, 71; yellow oat, in flower, 66; Swedish turnips, 64; narrow-leaved meadow grass, creeping beet, round-headed cocksfoot, and spiked fescue, 59; roughish and fertile meadow grass, flowering, 56; fiorin, in summer, 54; common turnips, 42; saint-foin, and broad-leaved and long-rooted clover, 39; white clover, 32; and lucern, 23.

The times of feeding should be as equally divided as convenience will permit; and when it is likely that the horse will be kept longer than usual from home, the nose-bag should invariably be taken. The small stomach of the horse is emptied in a few hours; and if he is suffered to remain hungry much beyond his accustomed time, he will afterwards devour his food so voraciously as to distend the stomach and endanger an attack of staggers. When this disease appears in the farmer's stable, he may attribute it to various causes; the true one, in the majority of instances, is irregularity in feeding. If the reader will turn back to page 104, he will be convinced that this deserves more serious attention than is generally given to it.

When extra work is required from the animal, the system of management is often injudicious; for a double feed is put before him, and as soon as he has swallowed it, he is started. It would be far better to give him a double feed on the previous evening, which will be digested before he is wanted, and then he may set out in the morning after a very small portion of corn has been given to him, or perhaps only a little hay. One of the most successful methods of enabling a horse to get well through a long journey is to give him only a little at a time while on the road, and at night to give him a double feed of corn and a full allowance of beans.

WATER.—This is a part of stable management little regarded by the farmer. He lets his horses loose morning and night, and they go to the nearest pond or brook and drink their fill, and no harm results; for they obtain that kind of water which nature designed them to have, in a manner prepared for them by some unknown influence of the atmosphere, as well as by the deposition of many saline admixtures. The difference between *hard* and *soft* water is known to every one. In hard water soap will curdle, vegetables will not boil soft, and the saccharine matter of the malt cannot be fully obtained in the process of brewing. There is nothing in which the different effect of hard and soft water is so evident as in the stomach and digestive organs of the horse. Hard water, drawn fresh from the well, will assuredly make the coat of a horse unaccustomed to it stare, and it will not unfrequently gripe and otherwise injure him. Instinct or experience has made even the horse himself conscious of this, for he will never drink hard water if he has access to soft: he will leave the most transparent and pure water of the well for a river, although the water may be turbid, and even for the muddiest pool.* He is injured, however, not so much by the hardness of the well-water as by its coldness—particularly by its coldness in summer, and when it is many degrees below the temperature of the atmosphere. The water in the brook and the pond being warmed by long exposure to the air, as well as having become soft, the horse drinks freely of it without danger.

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* Some trainers have so much fear of hard or strange water, that they carry with them to the different courses the water that the animal has been accustomed to drink, and that they know agrees with it.

If the horse were watered three times a day, and especially in summer, he would often be saved from the sad torture of thirst, and from many a disease. Whoever has observed the eagerness with which the over-worked horse, hot and tired, plunges his muzzle into the pail, and the difficulty of stopping him until he has drained the last drop, may form some idea of what he had previously suffered, and will not wonder at the violent spasms, and inflammation, and sudden death, that often result.

There is a prejudice in the minds of many people against the horse being fairly supplied with water. They think that it injures his wind, and disables him for quick and hard work. If he is galloped, as he too often is, immediately after drinking, his wind may be irreparably injured; but if he were oftener suffered to satiate his thirst at the intervals of rest, he would be happier and better. It is a fact unsuspected by those who have not carefully observed the horse, that if he has frequent access to water he will not drink so much in the course of the day, as another who, to cool his parched mouth, swallows as fast as he can, and knows not when to stop.

On a journey a horse should be liberally supplied with water. When he is a little cooled, two or three quarts of water may be given to him, and after that his feed. Before he has finished his corn two or three quarts more may be offered. He will take no harm if this be repeated three or four times during a long and hot day.

It is a judicious rule with travellers, that when a horse begins to refuse his food, he should be pushed no farther that day. It may, however, be worth while to try whether this may not proceed from thirst, as much as from exhaustion, for in many instances his appetite and his spirits will return soon after he has partaken of the refreshing draught.

Management of the Feet.—This is the only division of stable management that remains to be considered, and one sadly neglected by the carter and groom. The feet should be carefully examined every morning: for the shoes may be loose, and the horse would have been stopped in the middle of his work; or the clenches may be raised, and endanger the wounding of his legs; or the shoe may begin to press upon the sole or the heel, and bruise of the sole, or corn, may be the result; and, the horse having stood so long in the stable, every little increase of heat in the foot, or lameness, will be more readily detected, and serious disease may probably be prevented.

When the horse comes in at night, and after the harness has been taken off and stowed away, the heels should be well brushed out. Hand-rubbing will be preferable to washing, especially in the agricultural horse, whose heels, covered with long hair, can scarcely be dried again. If the dirt be suffered to accumulate in that long hair, the heels will become sore, and grease will follow; and if the heels are washed, and particularly during the winter, grease will result from the coldness occasioned by the slow evaporation of the moisture. The feet should be stopped—even the feet of the farmer's horse, if he remains in the stable. No clay stopping should be used, for it will get hard and press upon the sole: cowdung is the best stopping to preserve the feet cool and elastic; but before the stopping is applied, the picker must be run round the whole of the foot, between the shoe and the sole, to detect any stone which may have insinuated itself there, or a wound on any other part of the sole. For the hackney and hunter, stopping is indispensable. After several days' hard work it will afford very great relief to take the shoes off, having put plenty of litter under the horse, or to turn him, if possible, into a loose box; and the shoes of every horse, whether hardly worked or not, should be removed or changed once a month.

Chapter XIX.

ON SOUNDNESS, AND THE PURCHASE AND SALE OF HORSES.

There are few sources of greater annoyance both to the buyer and the seller of the horse, than disputes with regard to the soundness of the animal. Although, in describing the various parts of the horse, we have glanced at the connexion of certain natural conformations, and some alterations of structure, and accidents, and diseases, with the question of soundness and unsoundness, it may not be uninteresting to those for whom our work was designed, if we now bring into one point of view the substance of that which has been scattered over many pages.

That horse is sound in whom there is no disease, nor any alteration of structure in any part which impairs, or is likely to impair his natural usefulness. That horse is unsound that labours under disease, or that has some alteration of structure that does interfere, or is likely to interfere with his natural usefulness. The term '*natural usefulness*' must be borne in mind. One horse may possess great speed, but is soon knocked up; another will work all day, but cannot be got beyond a snail's pace: one with a heavy forehead is liable to stumble, and is continually putting to hazard the neck of his rider; another, with an irritable constitution and a washy make, loses his appetite and begins to scour if a little extra work is exacted from him. The term unsoundness cannot be applied to either of these; it would be opening far too widely a door to disputation and endless wrangling. The buyer can discern, or ought to know, whether the form of the horse is that which will render him likely to suit his purpose, and he should try him sufficiently to ascertain his natural strength, endurance, and manner of going. Unsoundness, we repeat, has reference only to disease, or to that alteration of structure which is connected with, or will produce disease, and lessen the usefulness of the animal.

These principles will be best illustrated by a brief consideration of the usual supposed causes of unsoundness.

Broken-knees certainly do not constitute unsoundness after the wounds are healed, unless they interfere with the action of the joint, for the horse may have fallen from mere accident, or through the fault of the rider; but no person would buy a horse with broken-knees until he had thoroughly tried him, and satisfied himself as to his form and action.

Capped Hocks may be produced by lying on an unevenly paved stable with a scanty supply of litter, or by kicking, in neither of which cases would they constitute unsoundness, though in the latter they would be an indication of vice; but in the majority of instances, they are either the consequence of sprain of the hock, and accompanied by enlargement of it, when they would be unsoundness. A special warranty should always be taken against capped hocks.

Contraction is a considerable deviation from the natural form of the foot, but not necessarily constituting unsoundness; it requires, however, a most careful examination on the part of the purchaser or veterinary surgeon, to ascertain that there is no heat about the quarter, or ossification of the cartilage; that the frog, although diminished in size, is not diseased; that the horse does not step short and go as if the foot were tender, and that there is not the slightest trace of lameness. Unless these circumstances, or some of them, are detected, a horse must not be pronounced to be unsound because his feet are contracted, for many horses with strangely contracted feet, are never lame: a special warranty, however, should be required where the feet are at all contracted.

Corns manifestly constitute unsoundness. The portion of the foot in which they are situated will not bear the ordinary pressure of the shoe; and any accidental additional pressure from the growing down of the horn, or the introduction of dirt or gravel, will cause serious lameness. They render it necessary to wear a thick and heavy shoe, or a bar shoe, to protect the weakened and diseased part; and corns are very seldom radically cured.

Cough.—This is a disease, and consequently unsoundness. However slight may be its degree, and of whatever short standing it is, although it may sometimes seem scarcely to interfere with the usefulness of the horse, a change of stabling, or slight exposure to wet and cold, or the least over-exertion, may at other times cause it to degenerate into many dangerous complaints. A horse, therefore, should never be purchased with a cough upon him without an especial warranty; or if, the cough not being observed, he is purchased under a general warranty, he may be returned as soon as it is discovered.

Roaring, Wheezing, Whistling, High-blowing, and Grunting, being the result of alteration of structure or disease in some of the air passages, and interfering with the perfect freedom of breathing, and especially when the horse is put on his speed, without doubt constitute unsoundness. There are decisions to the contrary, which are now universally admitted to be erroneous. Broken wind is still more decidedly unsoundness.

Crib-biting.—Although there is some difference of opinion among veterinary surgeons on this point, crib-biting must be regarded as unsoundness. This unnatural sucking in of the air must be to a certain degree injurious to digestion, must dispose to colic, and so interfere with the strength, and usefulness, and health of the horse. Some crib-biters are good goers, but they probably would have possessed more endurance had they not acquired this habit; and it is a fact well established, that as soon as a horse begins to become a crib-biter, he, in more than nine cases out of ten, begins to lose condition. He is not, to the experienced eye, the horse he was before. It may not lead on to absolute disease, or it may rarely do so to any considerable degree; but a horse that is deficient in condition, must, to that extent, have his capability for extraordinary work diminished, although not so as often to be apparent in ordinary work, and so far, the horse is unsound. Were there no other consideration, the wear of the front teeth, and even the frequent breaking of them, make a horse old before his time, and sometimes render it difficult or almost impossible for him to graze, when the state of the animal or the convenience of the owner require that he should be turned out.

Curb constitutes unsoundness while it lasts, and perhaps while the swelling remains, although the inflammation may have subsided; for a horse that has once thrown out a curb, is, for a while at least, very liable to do so again on the slightest extra exertion. A horse, however, is not returnable if he should spring a curb five minutes after the purchase, for it is done in a moment, and does not necessarily indicate any previous unsoundness or weakness of the part.

Cutting, as rendering a horse liable to serious injury of the legs, and indicating that he is either weak, or has an awkwardness of gait inconsistent with safety, should be considered as unsoundness. Many horses go lame for a considerable period after cutting themselves severely; and others have dropped from the sudden agony, and endangered themselves and their riders. As some doubt, however, exists on this subject, and as it is a very material objection to a horse, cutting, when evident, should have its serious consequences provided against by a special warranty.

Enlarged Glands.—The enlargement of the glands under the jaw has not been so much considered as it ought, in our estimate of the soundness of the horse. Simple catarrh will occasionally, and severe affection of the chest will generally be accompanied by swelling of these glands, and which does not subside for a considerable time after the cold or fever has apparently been cured. To a slight enlargement of the glands under the jaw much attention need not be paid; but if they are of considerable size, and especially if they are tender, and the gland at the root of the ear partakes of the enlargement, and the membrane of the nose is redder than it should be, we should hesitate in pronouncing that horse to be sound. We should fear the commencement, or the insidious lurking of disease.

Enlarged Hock.—A horse with enlarged hock is unsound. The structure of this complicated joint being so materially affected, that although the horse may appear for a considerable time to do ordinary work well, he will occasionally fail even as to that, and a few days' hard work will always lame him.

The Eyes.—That inflammation of the eye of the horse which usually terminates in blindness of one or both eyes, has the peculiar character of remitting or disappearing for a time, once or twice, or thrice, before it fully runs its course. The eye, after an attack of inflammation, regains so nearly its former natural brilliancy, that a man well acquainted with horses will not always recognise the traces of former disease. After a time, however, the inflammation returns, and the result is unavoidable. A horse from four to six years of age that has had one attack of this complaint, is long afterwards unsound, however perfect the eye may seem to be, because he carries about with him a disease that will again break out, and eventually destroy the sight. Whether, therefore, he may be returned or not, depends on the possibility of proving an attack of inflammation of the eye, prior to the purchase. Next to direct evidences of this are appearances about the eye, of which the veterinary surgeon at least ought not to be ignorant. They have been described at page 114. They consist chiefly of a puckering of the lids towards the inner corner of one or both eyes—a difference, although perhaps only a slight one, and not discovered except it be looked for, in the size of the eyes; a gloominess of the eye, a dulness of the iris, a little dulness of the transparent part of the eye generally,—a minute, faint, dusky spot, deep in the eye, and generally with little radiations of white lines proceeding from it: if these symptoms, or the majority of them, were observed at the time of purchase, the animal had assuredly been diseased before, and is unsound. Starting is an equivocal proof. It is usually an indication of defective sight, but it is occasionally a trick. Connected, however, with the appearances just described, it is a very strong corroborative proof.

If a man buys a horse actually blind, he may repent of his bargain, but he cannot get rid of it. He should be more careful, and the law will not protect him if he does not use common precaution.

Lameness, from whatever cause arising, is unsoundness. However temporary it may be, or however obscure, it lessens the utility of the horse, and renders him unsound for the time. How far his soundness may be afterwards affected, must depend on the circumstances of the case. A lame horse is for the time an unsound one.

Neurotomy.—A question has arisen how far a horse that has undergone the operation of the division of the nerve of the leg (see page 110), and has recovered from the lameness with which he was before affected, and stands his work well, may be considered to be sound. In our opinion there cannot be a doubt about the matter. Does the operation of neurotomy render a horse as capable of work as he was before he became affected with the disease on account of which, and to relieve him from the torture of which, the nerve was divided? Is the operation of neurotomy so invariably followed by capability, and continued capability of ordinary and even extraordinary work, that they may regularly be considered as cause and effect? The most strenuous defenders of the nerve operation cannot affirm this. They can only say that they partially suceeed in almost every fair case,—that they perfectly succeed in the majority of cases; but they cannot deny that the horse will batter and bruise that foot, when he has lost sensation in it, which should have been tenderly used; that even the hoof will sometimes be lost, after operations performed with the greatest judgment; that the lameness will sometimes return, after the animal has gone sound, one, two, or three years; and that, after all, there is a little unpleasantness, and even unsafeness in the action of the horse, from the peculiar manner in which the foot meets the ground when its feeling is destroyed; and that the horse is more liable to accidents, for he will travel on without warning his rider of the evil, after a piece of glass has penetrated his foot, or a stone has insinuated itself between the sole and the shoe; and thus irreparable mischief will be done, before the cause of it can possibly be detected. A horse on whom this operation has been performed may be improved—may cease to be lame, may go well for many years; but there is no certainty of his continuing to do so, and he is unsound.

Ossification of the lateral cartilages constitutes unsoundness, as interfering with the natural expansion of the foot, and in horses of quick work almost invariably producing lameness.

Pumiced-foot.—When the union between the horny and sensible lamellæ, or little plates of the foot (see p. 291), is weakened, and the coffin-bone is let down, and presses upon the sole, which yields to this unnatural weight, and becomes rounded, and comes in contact with the ground, and gets bruised and injured, that horse must be unsound, and unsound for ever, because there are no means by which we can lift up the coffin-bone again into its place.

Quidding.—If the mastication of the food gives pain to the animal, in consequence of soreness of the mouth or throat, he will drop it before it is perfectly chewed. This, as an indication of disease, constitutes unsoundness. Quidding sometimes arises from irregularity in the teeth, which wound the cheek with their sharp edges; or a protruding tooth renders it impossible for the horse to close his jaws so as to chew his food thoroughly. Quidding is unsoundness for the time; but the unsoundness will cease when the teeth are properly filed, or the catarrh relieved, or the cause of this imperfect chewing removed.

Quittor is unsoundness.

Ring-bone.—Although when the bony tumour is small, and on one side only, there is little or no lameness, and there are a few instances in which a horse with ring-bone has worked for many years without lameness; yet, from the action of the foot, and the stress upon the part, the inflammation and the formation of bone have such a tendency rapidly to spread, that we must pronounce the slightest enlargement of the pasterns or around the coronet, to be a cause of unsoundness.

Sandcrack is manifestly unsoundness; but it may occur without the slightest warning, and no horse can be returned for one that is sprung after purchase. Its usual cause is too great brittleness of the crust of the hoof; but there is no infallible method of detecting this, or the degree in which it must exist to constitute unsoundness. When the horn round the bottom of the foot has chipped off so much that only a skilful smith can fasten the shoe without pricking the horse, or even when there is a tendency in the horn to chip and break off in a much less degree than this, the horse may probably be returned as unsound, for this brittleness of the crust is a disease of the part, or it is such an altered structure of it as to interfere materially with the usefulness of the animal.

Spavin is unsoundness, whether the bony or the blood-spavin. In the first, lameness is produced, at least at starting, in ninety-nine cases out of a hundred, and there is enlargement of the hock, which rapidly spreads with quick and hard work, although the horse may be capable of, and may even get better at slow work. If there be no lameness, we would yet reject a spavined horse, because the bony enlargement is too near a very important and complicated joint, and on the least injury or sprain of that joint, would spread over it, and materially interfere with its motion.

Blood-spavin is unsoundness, because, although it may not be productive of lameness at slow work, the rapid and powerful action of the hock in quicker motion will produce permanent, although not considerable lameness, and which can scarcely ever be with certainty removed.

Splent.—It depends entirely on the situation of the bony tumour on the inside of the shank-bone, whether it is to be considered as unsoundness. If it is not in the neighbourhood of any joint, so as to interfere with its action, and if it does not press upon any ligament or tendon, it can be no cause of unsoundness, although it is often very unsightly. It does not lessen the capability and value of the animal. Of this we have treated at length at pages 241 and 350.

Stringhalt.—This singular and very unpleasant action of the hind leg cannot be termed unsoundness. It is an irregular communication of nervous energy to some muscle of the thigh, observable when the horse first comes from the stable, and gradually ceasing on exercise, and has usually been found in those horses that have a more than common degree of strength and endurance.

Thickening of the Back Sinews.—Sufficient attention is not always paid to the fineness of the legs of the horse. If the flexor tendons have been sprained so as to produce considerable thickening of the cellular substance in which their sheaths are enveloped, they will long afterwards, or perhaps ever after, be liable to sprain from causes by which they would otherwise be scarcely affected. The continuance of any considerable thickness around the sheaths of the tendons indicates previous and violent sprain. This very thickening will fetter the action of the tendons, and after much quick work will, from the very friction, occasionally renew the inflammation and the lameness; therefore, such a horse cannot be sound. It requires, however, a little discrimination to distinguish this from the *gumminess* or roundness of leg, peculiar to some breeds. There should be an evident difference between the injured leg and the others.

Thoroughpin, except it be of great size, is rarely productive of lameness, and therefore cannot, when unaccompanied by lameness, be termed unsoundness; but as it is the consequence of hard work, and now and then does produce lameness, the hock should be most carefully examined, and there should be a special warranty against it.

Thrush.—There are various cases on record of actions on account of thrushes in horses, and the decisions have been much at variance, or perfectly contradictory. Thrush has not been considered by legal men as unsoundness: it seemed to be necessary to prove lameness, or probable injury to the foot. We confess, however, that we are inclined to consider thrush as unsoundness. We are compelled to consider it so according to our definition, that every disease is unsoundness. It is inflammation of the lower surface of the inner or sensible frog, and the secretion or throwing out of pus, almost invariably accompanied by a slight degree of tenderness of the frog itself, or of the heel a little above it, and if neglected, leading to diminution of the substance of the frog, and separation of the horn from the parts beneath, and undermining, and the production of fungus and canker, and ultimately a diseased state of the foot, destructive of the present, and dangerous to the future usefulness of the horse.

Windgalls.—There are few horses perfectly free from windgalls, but they do not interfere with the action of the fetlock, or cause lameness, except when they are numerous or large. They constitute unsoundness only when they cause lameness, or are so large and numerous as to render it likely that they will soon cause it.

In the purchase of a horse the buyer usually receives, embodied in the receipt, what is termed a **warranty**. It should be thus expressed:—

> ‘Received of A. B. forty pounds for a grey mare, warranted only five years old, sound, free from vice, and quiet to ride and drive.
> £40. C. D.’

A receipt, including merely the word ‘warranted,’ extends only to soundness,—‘warranted sound’ extends no further; the age, freedom from vice, and quietness to ride and drive, should be especially named. This warranty extends to every cause of unsoundness that can be detected, or that lurks in the constitution at the time of sale, and to every vicious habit which the animal has hitherto shown. To establish a breach of the warranty, and to be enabled to return the horse or recover the price, *the purchaser must prove that it was unsound or viciously disposed at the time of sale.* In case of cough, the horse must have been heard to cough previous to the purchase, or as he was led home, or as soon as he had entered the stables of the purchaser. Coughing, even on the following morning, will not be sufficient; for it is possible that he might have caught cold by change of stabling. If he is lame, it must be proved to arise from a cause that could not have occurred after the animal was in the purchaser's possession. *No price will imply a warranty*, or be equivalent to one; there must be *an express warranty.* A fraud must be proved, in the seller, in order that the buyer may be enabled to return the horse or maintain an action for the price. The warranty should be given at the time of sale. A warranty, or a promise to warrant the horse, given at any period antecedent to the sale, is invalid; for the horse is a very perishable commodity, and his constitution and his usefulness may undergo a considerable change in a few days. A warranty after the sale is invalid, for it is given without any legal consideration. In order to complete the purchase, there must be a transfer of the animal, or a memorandum of agreement, or the payment of earnest-money: the least sum will suffice for earnest. No verbal promise to buy or to sell is binding without one of these; and the moment either of these is effected, the legal transfer of property or delivery is made, and whatever may happen to the horse, the seller retains or is entitled to the money. If the purchaser exercises any act of ownership, by using the animal without leave of the vendor, or by having any operation performed, or done to him, or medicines given, he makes him his own. The warranty of a servant is considered to be binding on the master *.

If the horse should be afterwards discovered to have been unsound at the time of warranty, the buyer may return it. Although not legally compelled to give notice to the seller of the discovered unsoundness, it will be better for it to be done. The animal should then be tendered at the house or stables of the vendor. If he refuses to receive him, it is cruel to tie up the poor beast in the street, and leave him to the tender mercies of the other party: it will be more advisable to send the animal to a livery-stable, for an action (the horse having been tendered) may be brought for expenses as well as for price. The keep, however, can be recovered only for the time that necessarily intervened between the tender and the determination of the action. It is not legally necessary to return the horse as soon as the unsoundness is discovered. The animal may be kept for a reasonable time afterwards, and even proper medical means used to remove the unsoundness; but courtesy, and indeed justice, will require that the notice should be given as soon as possible. Although it is stated, on the authority of Lord Loughborough, that 'no length of time elapsed after the sale will alter the nature of a contract originally false;' yet there are cases on record in which the plaintiff was nonsuited because he did not give notice of the unsoundness in a reasonable time. The extent of this reasonable time must depend on many circumstances. It used to be supposed that the buyer had no right to have the horse medically treated, and that he would vitiate the warranty by doing so. The question, however, would be, has he injured, or diminished the value of the horse by this treatment? It will generally, however, be prudent for him to refrain from all medical treatment, because the means adopted, however skilfully employed, may have an unfortunate effect, or what he does may be misrepresented by ignorant or interested observers.

When a horse is returned, and an action brought for the price, it will be indispensable that in every other respect, except the alleged unsoundness, the animal shall be as perfect and valuable as when bought.

The purchaser, possibly, may like the horse notwithstanding his discovered defect, and he may retain and bring his action for the depreciation in value on account of the unsoundness. Few, however, will do this, because the detention of the horse will cause a suspicion that the defect was of no great consequence, and will give rise to much cavil about the quantum of damages, and, after all, very slight damages will probably be obtained †.

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* The weight of authority decides that the master is bound by the act of the servant. Lord Kenyon, however, had some doubt on the subject.

† 'I take it to be clear law, that if a person purchases a horse that is warranted, and it afterwards turns out that the horse was unsound at the time of the warranty, the buyer may, if he pleases, keep the horse, and bring an action on the warranty; in which he will have a right to recover the difference between the value of a sound horse, and one with such defects as existed at the time of warranty; or he may return the horse, and bring an action to recover the full money paid; but in the latter case, the seller has a right to expect that the horse shall be returned to him in the same state he was when sold, and not by any means diminished in value; for if a person keeps a warranted article for any length of time after discovering its defects, and when he returns it, it is in a worse state than it

Where there is no warranty, an action may be brought on the ground of fraud, but this is very difficult to be maintained, and few possibly will hazard it. It will be necessary to prove that the dealer knew the defect, and that the purchaser was imposed upon by his false representation; and that, too, in a case in which a person of ordinary circumspection might have been imposed upon. If the defect was evident to every eye, the purchaser has no remedy — he should have taken more care; but if a warranty was given, it extends to all unsoundness, palpable or concealed. Although a person should ignorantly or carelessly buy a blind horse, warranted sound, he may return it—the warranty is his guard, and prevents him from so closely examining the horse as he otherwise would have done; but if he buys a blind horse, thinking him to be sound, and without a warranty, he has no remedy. The law supposes every one to exercise common circumspection and common sense.

A man should have a more perfect knowledge of horses than falls to the lot of most, and a perfect knowledge of the vendor too, who ventures to buy a horse without a warranty.

If a person buys a horse warranted sound, and discovering no defect in him, and relying on the warranty, resells him, and the unsoundness is discovered by the second purchaser, and the horse returned to the first purchaser, or an action commenced against him, he has his claim on the first seller, and may demand of him not only the price of the horse, or the difference in value, but every expense that may have been incurred.

Exchanges, whether of one horse absolutely for another, or a sum of money being paid in addition by one of the parties, stand on the same ground as simple sales. If there is a warranty on either side, and that is broken, the exchange is vitiated: if there be no warranty, deceit must be proved.

The subject of trial is a very intricate one, and we are inclined to think that the dealer is often very ill-used. It is well known that a horse from a dealer's stable is seldom or never fit for hard work until he has undergone some preparation and training. It is right that the purchaser should have a trial of him, but he should try him in a fair way—in a way consistent with the state in which the animal is. If a horse from a dealer's stable is galloped far and fast, it is probable that he will soon show distress; and if he is pushed farther, inflammation and death may ensue. The dealer rarely gets recompensed for this; and if it should occur soon after the sale, the horse is returned, or an action is brought for its price. When accidents have arisen in the fair trial of a horse, the decisions of the courts of law have been strangely contradictory; and, indeed, it is often difficult to determine whether the fault rests with the horse or the rider. If the horse be detained after the specified time of trial, he is supposed to be sold, and with all his faults.

In London, and in most great towns, there are repositories for the periodical sale of horses by auction. They are of great convenience to the seller, who can at once get rid of a horse with which he wishes to part, without waiting month after month before he obtains a purchaser, and who is relieved from the nuisance or fear of having the horse returned on account of breach of the warranty, because in these places only two days are allowed for the trial, and if the horse is not returned within that

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would have been if returned immediately after such discovery, I think the party can have no defence to an action for the price of the article on the ground of non-compliance with the warranty, but must be left to his action on the warranty to recover the difference in the value of the article warranted, and its value when sold.'—Curtis *v.* Hannay. 3 Esp. 83.

period, he cannot be returned afterwards. They are also convenient to the purchaser, who can thus in a large town soon find a horse that will suit him, and which, from this restriction as to the returning the animal, he will obtain twenty or thirty per cent. below the dealer's prices. Although an auction may seem to offer a fair open competition, there is no place at which it is more necessary for a person not much accustomed to horses to take with him an experienced friend, and when there to depend on his own judgment or that of his friend, heedless of the observations or manœuvres of the by-standers, the exaggerated commendations of some horses, and the thousand faults found with others. There are always numerous groups of low dealers, copers, and chaunters, whose business it is to delude and deceive.

The principal repositories in London, are Tattersall's, at Hyde Park Corner, on Monday and Thursday, at one o'clock, for racers, hunters, and superior horses of every kind, although many that are good for nothing find their way there.—Young's, at the Bazaar in King Street, Portman Square, on Tuesday and Saturday, at twelve o'clock, for horses of every description; and where, likewise, horses are always standing for private sale.—Dixon's, in Barbican, for machiners of every kind, and generally the best of them, with occasionally good hackneys; and Morris's, in St. Martin's Lane, for draught horses and hackneys of every grade and value. Horses should be sent two days before the sale; and it should be so contrived, if possible, that they should be placed about or beyond the middle of the catalogue; so that they may be brought out when those persons who lie abed until after noon, begin to appear. If the horses are bought in, the owner will have to pay 3*s.* 6*d.* per night for their keep, and 6*s.* for the offering them for sale: if they are sold, he will be charged with five per cent. for the auction-duty, five per cent. for commission, and the keep; and the balance may be received the day after the period of trial expires.

One of the regulations at the Bazaar is exceedingly fair, both with regard to the previous owner and the purchaser: viz.

'When a horse, having been warranted sound, shall be returned within the prescribed period, on account of unsoundness, a certificate from a veterinary surgeon, particularly describing the unsoundness, must accompany the horse so returned; when, if it be agreed to by the veterinary surgeon of the establishment, the amount received for the horse shall be immediately paid back; but if the veterinary surgeon of the establishment should not confirm the certificate, then, in order to avoid further dispute, one of the veterinary surgeons of the college shall be called in, and his decision shall be final, and the expense of such umpire shall be borne by the party in error.'

CHAPTER XXI.

THE SKIN AND ITS DISEASES.

THE skin of the horse differs little in construction from that of other animals. It consists of three parts, the *cuticle* or scarf-skin externally—very thin, and somewhat transparent, as is proved by the action of a blister when the cuticle is raised from the true skin beneath, in the form of almost pellucid bladders. The dandriff or scurf, which is brushed out in grooming, consists of scales or portions of the cuticle detached in the gradual change or renewal of this membrane. The parts within the frame as they are separated are carried off by the absorbents—the outer skin is more readily got rid of, in the form of scales. The cuticle is produced by the true skin, and is perforated by all its pores, whether exhalent or absorbent; and it adheres to the true skin through the medium of these pores, and likewise of little eminences or projections, which seem to be prolongations of the nerves of the skin.

It is doubtful whether the horse possesses to any considerable degree the sense of touch, or whether he is able to ascertain the form and nature of bodies by impressions made through the medium of the nerves of the skin. The skin is thinner about the muzzle than at other parts, because it is devoid of hair, but we never see this animal examining bodies by moving or rolling them about with his muzzle. He seems to examine them simply by the smell.

Beneath the cuticle is a thin soft substance, through which the pores and eminences of the true skin pass; and on which the horse depends for his colour. The dandriff or scurf of a black horse is as white as that of the lightest grey; and the skin beneath is of the same hue in all. The soft substance is called the *rete mucosum*, from its web-like structure, and its soft mucous consistence.

Under this is the *true skin*, very different in different breeds: thin and highly sensible in the blood horse; thick, and, fortunately for the animal, endowed with far less sensibility, in the common cart horse. Over a great part of the frame it lies upon a very singular muscle, peculiar to quadrupeds, and more extensive and powerful in thin-skinned and thin-haired animals than in those of thicker hides. It reaches from the poll over the whole of the carcass, and down to the arm before, and stifle behind. By its contraction the skin is puckered in every direction; and if it acts strongly and rapidly, the horse is not only enabled to shake off any insect or fly that may annoy him, but sometimes to displace a great part of his harness; and we have seen determinedly vicious horses shake themselves so violently that the most expert rider could scarcely keep his seat. This muscle also assists the skin in bracing that part of the frame which it covers, and perhaps it gives additional strength to the muscles beneath. It is called the *panniculus carnosus* of fleshy pinnacle or covering.

The skin answers the double purpose of protection and strength. Where it is necessary that the parts should be bound and knit together it adheres so tightly that we can scarcely raise it. Thus the bones of the knees and the pasterns and the tendons of the legs, on which so much stress is frequently thrown, are securely tied down and kept in their places It is in order to take additional advantage of this binding and strengthening power that we fire the legs of overworked horses, in whom the sinews have begun to start, and the ligaments of the joints to swell, or be displaced. We find the skin tight along the muscles of the back and loins, and down the yet more powerful muscles of the quarters; but in other places it seems to be destined only to protect the parts beneath, and there it is loosely attached, that it may not interfere with the motions of the animal. About the brisket, and within the arms and at the flanks, it hangs even in folds, to allow for the extraordinary distension of those parts in rapid action.

Of its strength we have abundant proof, both in the living and dead animal. Its fibres are interlaced in a most curious and intricate manner, so as, when living, to be scarcely lacerable. It offers considerable resistance even to the knife, and is converted into leather after death.

It is, while the animal is alive, one of the most elastic bodies with which we are acquainted. It not only perfectly adapts itself to the slow growth or decrease of the body, and appears equally to fit, whether the horse is in the plumpest condition or reduced to a skeleton, but when a portion of it is distended to an extraordinary degree in the most powerful action of the muscles, it in a moment again contracts to its usual dimensions. It is principally indebted for this elasticity to almost innumerable little glands which pour out an oily fluid that softens and supples it. When the horse is in health, and every organ discharges its proper functions, a certain quantity of this unctuous matter is spread over the surface of the skin, and is contained in all the pores that penetrate its substance, and the skin is pliable, easily raised from the texture beneath, easily doubled between the finger and thumb, and presenting that peculiar yielding softness and elasticity which experience has proved are the best proofs of the condition, that is, the general health of the animal. Then, too, from the oiliness and softness of the skin, the hair lies in its natural and proper direction, and is smooth and glossy,—another proof of the condition of the horse. When the system is deranged, and especially the digestive system, and the vessels concerned in the nourishment of the animal cease to act, or act feebly, the vessels of the skin immediately, and to a very marked degree, sympathize; and this oily secretion is no more thrown out, and the skin loses its pliancy, and it is difficult or almost impossible to take it up between the finger and thumb, and, losing its pliancy, it seems to cling to the animal, and we have that peculiar feeling which we call

HIDE-BOUND.

Hide-bound is not so much a diminution of the cellular or fatty substance between the skin and the muscles and bones beneath, as it is an alteration in the skin itself. It is a hardness and unyieldingness of the skin from the want of the oily matter on its surface, and in its substance, which has just been mentioned. It is precisely the difference which is presented to the feeling by well-curried and supple leather, and that which has become dry and unyielding.

The surface of the skin becoming dry and hard, the scales of the cuticle no longer yield to the hair, but, separating themselves in every direction, turn the hair various ways, and give that staring coat or irregular direction of the hair which accompanies want of condition. This state of the skin, by proving the impaired functions of the vessels of the skin, shows the impaired function of the vessels everywhere, and particularly those of the stomach and bowels. The horseman should remember that hide-bound is not so much a disease, as a symptom of disease, and particularly of the digestive organs; and our remedies must be applied not so much to the skin, (although we have, in friction and in warmth, most valuable agents in producing a healthy condition of the integuments,) as to the *cause* of the binding of the coat and the state of the constitution generally. Every disease that can affect the general system is likely to produce this derangement of the functions of the skin. Glanders, when become constitutional, is strongly characterised by the unthrifty appearance of the coat. Chronic cough, grease, farcy, and founder, are accompanied by hide-bound; and diet too sparing, and not adequate to the work exacted, is an unfailing source of it. If the cause be removed, the effect will cease.

Should the cause be obscure, as it frequently is—should the horse wear an unthrifty coat, and his hide cling to his ribs, without any apparent disease, we shall be warranted in tracing it to sympathy with the actual, although not demonstrable suspension of some important secretion, and, we repeat, generally in the alimentary canal: therefore a few mashes, and a mild dose of physic, are first indicated, and, simple as they appear to be, they often have a very beneficial effect. The regular action of the bowels being re-established, that of all the organs of the frame will speedily follow. If the horse cannot be spared for physic, alteratives may be administered. There is no better alterative for being hide-bound and having an unthrifty coat than that which is in common use, and which we have so often recommended, levigated antimony, nitre, and sulphur; and given, in these cases, in doses of two drachms of the first, three of the second, and four of the last, and repeated every night in a mash, or in the form of ball. The peculiar effect of the antimony and sulphur on the skin, of the sulphur on the bowels, and of the nitre on the urinary organs, will be here advantageously combined.

Should the horse not feed well, and there be no indication of fever, a slight tonic may be added, as one drachm of gentian, and half a drachm of ginger; but in the majority of cases attended by loss of condition, and an unthrifty coat, and hide-bound, tonics and aromatics should be carefully avoided. The cause of the impaired action of the vessels being removed, the powers of nature will generally be sufficient, and had better be let alone. There are not any more dangerous medicines in common use in the stable, and especially in cases like these, than tonics and cordials. They often arouse to fatal action a tendency to fever that would otherwise have slept, or they produce a state of excitement near akin to fever, and apt to degenerate into it. By the stimulus of a cordial the secretions may be suddenly roused, and among them, this unctuous secretion from the pores of the skin, so necessary to apparent condition; but the effect soon passes over, a repetition of the stimulus is necessary—the habit is soon formed—the dose must be gradually increased, and in the mean time the animal is kept in a state of dangerous excitement, and the powers of nature must be eventually impaired.

Friction may be employed with advantage in the removal of hide-bound. It has repeatedly been shown that it is one of the most efficacious instruments we can use to call into exercise the suspended energies either of the absorbent or secreting vessels. Warmth may likewise be employed, not warmth of stable, which has been shown to be so injurious, and that in a much more important way than the mere want of condition, but warmth of clothing. But before this can be fully considered, the hair by which the skin is covered must be described.

THE HAIR.

The hair is the natural clothing of all our domestic quadrupeds. It is some protection from violence, and more so from cold; and it varies with the climate in which they live. It springs from below the skin. There are found on the cellular and fatty substance, immediately in contact with the internal surface of the skin, numerous little bulbs, which penetrate into and pass through the true skin, and which arriving at the cuticle, the hair protrudes from the summit of them. The hair itself, when examined through a microscope, is seen to be a little tube, containing a pulpy matter, which runs through the whole length of it, by which probably the hair is fed, and rendered pliant; and the loss of which under disease may add to the hard and unthrifty feeling of the coat of a horse out of condition. There is no essential difference in the structure of the hair in different parts, as the mane, the tail, and the body, except that the former is larger, longer, and stronger.

The base of the bulb whence the hair proceeds being beneath the true skin, it is easy to perceive that the hair will grow again, although the cuticle may have been destroyed. A good blister, although it may remove the cuticle, and seemingly for a while the hair with it, leaves no lasting blemish. Even firing, lightly and skilfully performed, and not penetrating through the skin, leaves not much blemish; but when, in broken knees, the true skin is cut through, or destroyed, there will ever remain a spot devoid of hair. The method of hastening and perfecting the re-production of the hair has been described in p. 243.

PORES OF THE SKIN.

Beside the openings already mentioned through which proceeds this unctuous fluid to supple and soften the skin, there are others more numerous, through which a vast quantity of aqueous fluid escapes, and perspiration is carried on; and, as in the human being, this actually exists in a state of health and quietness, although imperceptible, yet, when the animal is excited by exercise, or labours under some stages of disease, it becomes visible, and appears in the form of drops.

This process of perspiration is not, however, so far under the control of medicine as in the human being. We can, indeed, abate those profuse perspirations which accompany want of condition, or moulting, or disease, but we cannot easily produce or increase the visible perspiration.

We are not aware of any medicine that will certainly produce it. Warm clothing seems occasionally to effect it, but this is more in appearance than reality. The insensible perspiration cannot escape through the mass of clothing, and assumes a visible form. This, perhaps, is the case, even when sheep-skins are applied over the back and loins in "locked jaw;" and they produce a good effect, acting as a warm poultice over the part, and so contributing to relax the muscular spasms. There are, however, some medicines, as antimony and sulphur, which have an evident and very considerable effect on the skin, in opening its pores and exciting its vessels to action.

Of the existence of absorbent vessels on the skin, or those which take up some fluid or substance, and convey it into the circulation, we have satisfactory proof. A horse is even more easily salivated than the human being. Salivation has been produced by rubbing a splint with mercurial ointment, previous to blistering; and a very few drachms rubbed on the inside of the thighs will probably produce a greater effect than the practitioner desires.

From some parts of the skin there are peculiar secretions, as that of grease in the heel, and mallenders in the knee.

MOULTING.

Twice in the year the hair of the body of the horse is changed. The hair of the mane and tail remains. The bulbous root of the hair does not die, but the pulpy matter seems to be removed from the root of the hair, which, thus deprived of its nourishment, perishes and drops off, and a new hair springs at its side from the sume bulb. As this is a process extending over the whole of the skin, and requiring a very considerable expenditure of vital power, the health of the animal is generally affected at these times. That energy and nervous and vital influence, which should support the whole of the frame, is to a great degree determined to the skin, and the animal is languid, and unequal to much hard work. He perspires greatly with the least unusual exertion, and if he is pressed beyond his strength becomes seriously ill.

The treatment which the groom in this case adopts is most absurd and dangerous. The horse, from the deranged distribution of vital power, is disposed to fever, or he labours under a slight degree of fever, sufficiently indicated by the increased quickness of pulse, redness of nose, and heat of mouth. The lassitude and want of appetite which are the accompaniments of this febrile state, are mistaken for debility; and cordials of various kinds, some of them exceedingly stimulating, are unsparingly administered. Common sense would require, that in this deranged distribution of power, excitants should be scrupulously avoided; not only no cordials should be given, but the usual quantity of food should be diminished—bran mashes should be given—a little fever or alterative medicine should be administered, such as that which we have just described, and the horse should be a little more warmly clothed, and sudden or too great exposure to cold should be guarded against. There is no doubt that spices hasten the process of moulting. The old hair is evidently more speedily thrown off, and the new produced, but this at the expense of greater derangement of the constitution—greater fever—and no little danger, if, during this process of moulting, and while nature is thus unnaturally forced on, disease of a febrile character should attack the animal. Friction may be allowed, to assist the falling off of the old hair, and to loosen the cuticle for the appearance of the new hair, but it should be gentle. The currycomb should by no means be used—even the brush should not be applied too hard or too long. The old hair must not be forced off before the young hair is ready to take its place. The exercise should be moderate—the clothing rather warmer than usual, and the water chilled. Nature adapts the coat to the climate and to the season. The Sheltie has one as long and as thick as that of a bear; and as the summer is short and cold too in those northern islands, the coat is rough and shaggy during the whole of the year. In the deserts of Arabia, where the winter is rarely cold, the coat remains short and glossy throughout the year. In our climate, the short covering of summer is succeeded in autumn by one of considerably greater length and thickness; and that in its turn yields in the spring to the lighter clothing which summer requires. As a thin and glossy coat adds to the beauty of the horse, and is identified, to a great degree improperly, with his condition, an artificial system has been adopted, by which the coat shall remain of nearly the same length, and that a short one, during the year. Nature changes it with the change of season; man contrives that there shall be no change of season in the stable. It is always summer there—always sufficiently hot to make a long coat useless, and therefore nature, who accommodates herself to circumstances, does not give it. The exposure to cold during the few hours of exercise may roughen the coat for a little while, but the hot clothing and the hot air of more than twenty hours out of the twenty-four, give the character to the covering which nature bestows on such an animal. This system is not now carried to the injurious extent that it used to be, but it yet partakes too much of absurdity and danger. The inflammatory complaints to which these hot-house animals are subject, and the average shortness of their lives, are sufficient proofs of the error of the practice.

The farmer has, or should have, little to do with this artificial management of the coat, and he may be assured that his hackney, or his hunter, if he does occasionally venture to follow the hounds, will, with his winter hair upon him, be to all intents and purposes in as full condition, and as strong and as stout, as the glossiest-coated horse in the field, if he has been sufficiently and properly fed and trained for the purpose.

Hunters that are summered out, as reason and humanity demand, should, however, if they are to wear the short fashionable coat, be taken up before the end of June, not only because the grass may then begin to fail, and the ground to grow hard, and the flies to annoy, but that they may be accustomed to the warmth of the stable by day and by night, for a sufficient time before the moulting season commences, and that the coat may be accommodated to that warmth; for if they are suffered to remain out until the autumnal coat begins to grow, no grooming will remove it until the following spring.

CLIPPING.

As to the newly invented practices of clipping, and its supposed improvement, shaving the horse, and especially the hunter, such deviations from nature rarely come to any good. There may not be so much perspiration hanging about the hair when the hunter, warmed by a long burst, comes to a check on a piercing day, and therefore the cooling process of evaporation in such a situation may not be so long continued; but let it be remembered that this cold must be abundantly more intense, when the frosty air comes in immediate contact with the heated skin. It is during these pauses of action that the animal wants clothing to protect him from the chilling injurious effect of the piercing blast upon the opened steaming pores of the skin. While the animal is in action, a sufficient supply of heat is obtained by the effect of that action on the capillaries, and the increased development of temperature; but when the action is suspended, some clothing, natural or artificial, something through which the animal heat shall not escape, is absolutely necessary to prevent the chilling of the frame, the exhaustion of vital power, and the dangerous re-action of fever.

COLOUR.

The colour of the hair admits of every variety, and each colour becomes in turn fashionable. The colour of the hair, like that of the skin, is influenced by, or depends on, that of the mucous mesh-work under the cuticle. There are comparatively few perfectly white horses now remaining. The snow-white palfrey, with its round carcass, and barb head, originally from Spain, or perhaps from Barbary, and rarely exceeeding the size of a Galloway, is now nearly extinct. Some yet remain in the possession of the Duke of Montrose. They are of good constitution and pleasant in their paces. The majority of white horses are those that have become so. Light-grey colts begin to grow white before they are five years old, especially if they have not much dark mixture about the joints.

Grey horses are of different shades, from the lightest silver to a dark iron grey. The silver grey reminds the observer of the palfrey, improved by an admixture of Arab blood. He does not often exceed fourteen hands and a half high, and is round carcassed—light legged—with oblique pasterns, calculated for a light carriage, or for a lady's riding—seldom subject to disease—but not very fleet, or capable of hard work.

The iron grey is usually a larger horse; higher in the withers, deeper and thinner in the carcass, more angular in all his proportions, and in many cases a little too long in the legs. Some of these greys make good hackneys and hunters, and especially the Irish horses; but they are principally used for the carriage. They have more endurance than the flatness of the chest would promise; but their principal defect is their feet, which are liable to contraction, and yet that contraction not so often accompanied by lameness as in many other horses.

The dappled grey is generally a handsomer and a better horse: all the angular points of the iron grey are filled up, and with that which not only adds to symmetry, - but to use. Whether as a hackney, or, the larger variety, a carriage-horse, there are few better, especially since his form has been so materially improved, and so much of his heaviness got rid of, by the free use of foreign blood. There are not, however, so many dappled greys as there used to be, since the bays have been bred with so much care. The dappled grey, if dark at first, generally retains his colour to old age.

Some of the greys approach to a nutmeg, or even bay colour. Many of these are handsome, and most of them are hardy.

The roans, of every variety of colour and form, are composed of white mixed with bay or red, or black. In some it seems to be a natural mixture of the colours; in others it appears as if one colour was powdered or sprinkled over another. They are pretty horses for ladies or light carriages, and many of them easy in their paces, but they do not usually display much blood, nor are they celebrated for endurance. If they should have white fore legs, with white hoofs, they are too often tender-footed, or become so with even a little hard work.

The strawberry horse is a mixture of sorrel with white; usually handsome and pleasant, but more celebrated for these qualities than for strength and endurance.

The pied horse is one that has distinct spots or patches of different colours, but almost invariably of white with some other colour. They are not liked as hackneys, on account of their peculiarity of colour, nor in teams of horses; but they look well when tolerably matched in a phaeton or light carriage. Their value must depend on their breed; but of themselves they have no peculiar character, except that a white leg and foot is as suspicious in them as it is in the roan.

The dun, of the Galloway size, and with considerable blood, is often attached to the curricle or the phaeton; but the larger is a true farmer's or miller's horse, with no great speed, and not always extraordinary strength, and sometimes a little of a drone, yet a good-tempered, good-feeding, good-constitutioned, useful horse enough. Varieties of the dun, shaded with a darker colour, or dappled, and with some breeding, and not standing too high, are very beautiful, and are sought after for light carriages, and particularly for ladies to drive.

The cream-colour, of Hanoverian extraction, with his white iris and red pupil, is appropriated to royal use. Attached to the state-carriage of the monarch, he is a superb animal. His bulky, yet perfectly-formed body, his swelling crest, and his proud and lofty action, as if conscious of his office, qualify him for the service which is exacted from him, but we have no experience how far he would suit other purposes.

Of the chesnuts there are three varieties — the lightest red or the sorrel, usually with white about them, either on the face or the legs,— generally lightly made, yet some of them bulky enough for the heaviest loads. Their colour is generally considered objectionable. Many of them have no breeding at all, and the best bred are supposed to be somewhat deficient in endurance.

The light chesnut, with less red and a little more bay or brown, is considered as a preferable horse, especially if he has no white about him, or only a small portion of it; yet even he, although pleasant to ride, is sometimes irritable, and generally weak. We must except one variety, the Suffolk punch; a heavy horse, and adapted for slow work, but perfect in his kind, which no labour can daunt, no fatigue overcome. This is a breed now, unfortunately, nearly extinct. The present variety, however crossed, is not equal to the old Suffolk.

The dark chesnut is as different a horse from the hackney-light-chesnut as can be easily imagined; round in the carcass, powerful in the quarters, but rather fine in the legs: possessed of great endurance, and with a constitution that rarely knows an ailment, except that the feet are small and disposed to contraction, and that accompanied by lameness, and that the horse is too often of a hot and unmanageable temper.

Of the bays, there are many varieties, and they include the very best of our horses of every description. The bright yellow bay, although very beautiful, and especially if his mane and tail are black, is the least valuable, because the lighness of his colour seems to give him some tenderness of constitution. The proper bay, with no white about him, and black from the knees and the hocks to the feet, is the most desirable of all colours; he has generally a good constitution, naturally good feet, and, if his conformation is not faulty, will turn out a valuable horse for almost every purpose.

As we approach to the brown, we find in the bay-brown not always so much show and action, but more strength and endurance, and more usefulness. He usually has more substance than the lighter bay, and more depth of leg; and, could we find the same degree of breeding, he would be as handsome, and more valuable. A good bay-brown or a brown horse, with a sufficient quantity of blood, is indeed a good horse.

When, however, we arrive at the browns, it is necessary to examine the degree of breeding. This colour is not so fashionable, and therefore these horses have been considerably neglected There are many good ones, and those that are good are valuable; but many of them are only a half or a quarter bred, and therefore comparatively coarse, yet useful for the saddle and for harness, for slow work, and occasionally for that which is more rapid.

The black-brown is generally more neglected so far as its breed is concerned, and deserves to be examined more carefully. It frequently, however, retains much of the goodness of constitution of the brown and bay-brown.

Of the black greater care has been taken. The heavy black of Lincolnshire and the midland counties is a noble animal, and would be almost beyond price if he could be rendered more active. The next in size form the majority of our waggon-horses, and perhaps our best; and on a smaller breed still, and to the improvement of which much attention has been devoted, many of our cavalry are mounted. A few black thorough-bred horses and black hunters have been seen, but the improvement of horses of this colour has not been studied, except for the purposes that have been mentioned. Their peculiar high action, while not unobjectionable for draught, and desirable for the parade, would be unbearable in the roadster; and some have said, that black horses are more subject to vice, disease, and blindness, than any other colour. This charge is not, perhaps, true to its full extent, but there certainly are a great many worthless black horses in every part of the country.

After all, there is an old saying, that a good horse cannot be of a bad colour; and it is far more necessary to attend to the conformation and points of the horse than to his colour. These observations, however, although they admit of many exceptions, may be useful in guiding to the judicious purchase of the horse.

SURFEIT.

Large pimples or lumps often suddenly appear on the skin of the horse, and especially in the spring; and occasionally they disappear as quickly as they came. Sometimes they seem to be attended with great itching, but at others they appear not in the least to annoy the animal. When they have remained a few days, the cuticle frequently peels off, and a small scaly spot, though rarely a sore, is left. This is called a surfeit, from its resemblance to some eruptions on the skin of the human being, when indigestible or unwholesome food has been taken. These lumps are, in some cases, confined to the neck; but they oftener spread over the sides, back, loins, and quarters. The cause is enveloped in some obscurity. The disease most frequently appears when the skin is irritable during or after the process of moulting, and when it sympathises most with any disorder of the stomach; therefore, some veterinary surgeons have attributed it to indigestion. It has been known to follow the eating of poisonous herbs or mow-burnt hay, but much oftener it is to be traced to exposure to cold when the skin was previously irritable and the horse heated by exercise; it has also been attributed to the immoderate drinking of cold water when the animal was hot. It is obstruction of some of the pores of the skin and swelling of the surrounding substance, either from primary affection of the skin, or from its sympathy with the digestive organs.

Bleeding will always be beneficial—from three to five quarts may be taken, according to the strength of the horse, the extent of the eruption, and the degree of fever. Physic never does good. If surfeit be connected with some unhealthy affection of the stomach or intestines, it is that which the nausea or subsequent action of the purgative increases. Alteratives will be found useful—and particularly the alterative which was recommended for hide-bound (p. 371), and in the same doses. These should be given on several successive nights. The night is better than the morning, because the warmth of the stable will cause the antimony and sulphur to act more powerfully on the skin. The horse should be warmly clothed—half an hour's walking exercise should be given, an additional rug having been thrown over him—such green meat as can be procured should be used in moderate quantities, and the chill should be taken from the water.

Although the eruption may disappear after the bleeding, and that very quickly, it will, if the horse be exposed to cold, come out again as suddenly, and as extensively as before. It will rarely, however, be advisable to repeat the bleeding.

Should the lumps, after several of these alternate appearances and disappearances, remain, and the cuticle and the hair begin extensively to peel off, a worse affection is to be feared, for it is far from unusual for surfeit to precede or degenerate into mange. This disorder, therefore, shall next be considered.

MANGE

Is a pimpled or lumpy eruption. After a while the vesicle breaks, the cuticle and the hair fall off, and there is, as in obstinate surfeit, a bare spot left covered with scurf; but some fluid oozes from the skin beneath, and this scurfiness changes to a scab, which likewise soon peels off, and leaves a wider spot: sometimes another scab succeeds to the first, but oftener a mere scaly, greasy-feeling, bare spot remains. This is attended with considerable itching and tenderness, and thickening of the skin, which soon becomes more or less folded or puckered. The mange generally first appears on the neck, at the root of the mane, and its existence may be pretty truly ascertained, even before the blotches appear, and when there is only considerable itchiness of the part, by the ease with which the short hair at the root of the mane is plucked out. From the neck it spreads upward to the head, or downwards to the withers and back, and occasionally extends over the whole carcass of the horse.

One cause of it, although an unfrequent one, has been stated to be neglected or inveterate surfeit. The more common cause is contagion. Amid the whole list of diseases to which the horse is exposed, there is not one more highly contagious than mange. If it once gets into a stable, it spreads through it, for the slightest contact seems to be sufficient for the communication of this noisome complaint.

If the same brush or currycomb be used on all the horses, the propagation of mange is assured; and horses feeding in the same pasture with a mangy one rarely escape, from the propensity they have to nibble one another. Mange in cattle has been propagated to the horse, and from the horse to cattle, but there is no authenticated instance of the same disease in the dog being communicated to the horse. There is as much difference in the character and appearance of mange in the horse and dog, as between either of them and the itch in the human subject; and the itch has never been communicated to the quadruped, nor the mange of the quadruped to the human being.

Mange has been said to originate in want of cleanliness in the management of the stable. The comfort and the health of the horse demand the strictest cleanliness. The eyes and the lungs frequently suffer from the noxious fumes of the putrefying dung and urine; but, in defiance of common prejudice, there is no authentic instance of mange being the result. It may, however, proceed from poverty. When the animal is half-starved, and the functions of digestion and the powers of the constitution are weakened, we have seen, in the cases of hide-bound and surfeit, that the skin soon sympathises, and we can imagine that mange may occasionally be produced instead of surfeit and hide-bound. Every farmer has proof enough of this being the case. If a horse is turned on a common, where there is scarcely sufficient herbage to satisfy his appetite, or if he is placed in one of those straw-yards which, under the management of mercenary and unfeeling men, are the very abodes of misery, the animal comes up a skeleton, and he comes up mangy too. Poverty and starvation are fruitful sources of mange, but it does not appear that filth has much to do with it, although poverty and filth generally go hand in hand.

The propriety of bleeding in cases of mange must depend on the condition of the patient. If mange be the result of poverty, and the animal is much debilitated, bleeding will be adding power to the cause of the disease. Physic, however, is indispensable. It is the first step in the progress towards cure. A mercurial ball will be preferable to a common aloetic one, as more certain and effectual in its operation, and the mercury having probably some influence in mitigating the disease. In this, however, mange in the horse resembles the itch in the human being—that medicine alone will never effect a cure. There must be some local application. There is this further similarity, that that which is most effectual in curing this disgraceful complaint in man, must form the basis of every local application as it regards the horse. Sulphur is indispensable in every unguent for mange; it is the sheet-anchor of the veterinary surgeon.

In an early, and not very acute state of mange, one ounce of the flowers of sulphur should be well rubbed down with an equal quantity of train oil, and half an ounce of common turpentine. Farriers are fond of the black sulphur, but that which consists of earthy matter, with the mere dregs of the sulphur, cannot be so effectual as the flowers, which are pure sublimed sulphur. A tolerably stout brush, or even a currycomb, lightly applied, should be used wherever there is any appearance of mange, to remove the dandriff or scurf. After that, the horse should be washed with strong soap and water as far as the disease has extended; and when he has been thoroughly dried, the ointment should be well rubbed in with the naked hand, or with a piece of flannel. More good will be done by a little of the ointment being well rubbed in, than by a great deal being merely smeared over the part. The rubbing should be daily repeated. The sulphur seems to have a direct influence on the disease—the turpentine has an indirect one, by exciting some irritation on the skin of a different nature to that produced by the mange, aud under the influence of which the irritation of mange will be diminished, and the disease more easily combated. During the application of the ointment, and as soon as the physic has set, an alterative ball or powder similar to those recommended for the other affections of the skin, should be daily given. If, after some days have passed, no progress should appear to have been made, half a pound of sulphur may be well mixed with a pint of oil of tar, or, if that is not to be obtained, a pint of Barbadoes tar, and the affected parts rubbed as before. On every fifth or sixth day the ointment should be washed off with warm soap and water. The progress towards cure will be ascertained; the skin will be cleansed, and its pores opened, for the more effectual application of the ointment.

The horse should be well supplied with nourishing, but not stimulating food. As much green meat as he will eat should be given him, or, what is far better, he should be turned out if the weather is not too cold. It may be useful to add, that, after the horse has been once well dressed with either of these liniments, the danger of contagion ceases. It is necessary, however, to be assured that every mangy place has been anointed.

It will be prudent to give two or three dressings after the horse has been cured apparently, and to continue the alteratives for ten days or a fortnight. The cure being completed, the clothing of the horse should be well soaked in water, to which a fortieth part of the saturated solution of the chloride of lime has been added; after which, it should be washed with soap and water, and again washed and soaked in a solution of the chloride of lime, as before. Every part of the harness should undergo a similar purification. The currycomb may be scoured, but the brush should be burnt. The rack and manger, and partitions, and every part of the stable which the horse could possibly have touched, should be well washed with a hair broom, a pint of the chloride of lime being added to three gallons of water. All the wood-work should then be scoured with soap and water, after which a second washing with the chloride of lime and water will render all secure. Some farmers have pulled down their stables when they have been thoroughly infected with mange. This is being unnecessarily cautious. The efficacy of the chloride of lime was not then known: and if it is carefully and sufficiently applied to every part of the stable and its furniture, there cannot afterwards be danger.

Every case of itchiness of the skin should be regarded with suspicion. When a horse is seen to rub the root of his tail, or his head or neck, against the manger, the parts should be carefully examined. Some of the hair may have been rubbed or torn off, but if the roots remain firmly adherent, and there be only redness and not scurfiness of the skin, it probably is not mange, but only inflammation of the skin, from too great fulness of blood. A little blood should be taken away — a purgative administered, and the alteratives given. The mange ointment cannot do harm, and may possibly prevent this heat of the skin from degenerating into mange, or stop the progress of mange, if it has commenced. If a scurfiness of skin should appear on any of the points that are pressed upon by the collar or harness, the veterinary surgeon will do right to guard against danger, by alterative medicine and the use of the ointment.

WARTS.

These are tumours of variable size, arising first from the cuticle, and afterwards connected with the true skin by means of the vessels which supply the growth of the tumours. They are found sometimes on the eyelids, on various parts of the skin, and on the prepuce. They must be removed by an operation. If the root be very small, it may be snipped asunder with a pair of scissars, close to the skin, and the root touched with the lunar caustic. If the pedicle or stem be somewhat larger, a ligature of waxed silk may be passed firmly round it, and tightened every day. The source of nutriment being thus cut off, the tumour will, in a few days, die and drop off. If they are large, or in considerable clusters, it will be necessary to cast the horse, to cut them off close to the skin, and sear the root with a red-hot iron. Unless these precautions are used, the warts will speedily sprout again.

Chapter XXII.

A LIST OF THE MEDICINES USED IN THE TREATMENT OF THE DISEASES OF THE HORSE.

He will rarely consult his own interest, who, not having had the advantage of a veterinary education, undertakes the treatment of any of the serious diseases of his horses. Many of the maladies of the horse so nearly resemble each other—and are so continually varying their character, and require, in their different stages, so different a treatment; and in the plainest case not only the characteristic symptoms of disease are obscure, but even the indications of returning health, or increasing danger, often scarcely ascertainable—so that the sick horse, as well as the human being, needs the care of one whom study and experience have qualified for the task. A list, however, of the drugs generally used, with a slight account of their history, adulterations, and medicinal effects, will be interesting to the horse-proprietor as well as to the veterinary surgeon; and may occasionally be useful when professional aid cannot be obtained.

Aloes. There are two kinds used in horse practice, the Barbadoes and the Cape. The Socotorine, preferred by the human surgeon, are very uncertain in their effect on the horse. Of the Barbadoes and the Cape, the first are much to be preferred. The Barbadoes aloes are obtained principally from the island of Barbadoes, and are the juice of the large leaves of the aloe boiled to a considerable thickness, and then poured into gourds in which they gradually harden. The true Cape is the extract of a species of aloes chiefly cultivated at the Cape of Good Hope. The Socotorine aloes are of a brown colour, inclining to red, and brittle. The Barbadoes aloes are black, with a shade of brown, of an unctuous feeling, with a stronger smell, broken with difficulty, and the fracture dull. The Cape are darker coloured, stronger smelling, very brittle, and the fracture perfectly glossy. Every person who uses much aloes should buy them in the mass, and powder them himself, and then, by attending to this account of the difference of the three, he can scarcely be imposed upon. Aloes purchased in powder are too often sadly adulterated. The Cape may be powdered at all times, and the Barbadoes in frosty weather, when enough may be prepared, to be kept in closed bottles, for the year's consumption. They may also be powdered when they have been taken from the gourd, and exposed to a gentle heat for two or three hours before they are put into the mortar. Fifteen ounces of the powder, mixed with one ounce of powdered ginger, and beaten up with eight ounces of palm oil, and afterwards divided into the proper doses, will form a purging mass more effectual, and much less likely to gripe, than any that can be procured by melting the drug. If the physic is given in the shape of ball, it more readily dissolves in the stomach, and more certainly and safely acts on the bowels when made up with some oily matter, like that just recommended, than when combined with syrup or honey, which are apt to ferment, and be themselves the causes of gripes. It is also worse than useless to add any diuretic to the mass, as soap or carbonate of soda. The action of these on one set of organs will weaken the action of the aloes on another. A physic mass should never be kept more than two or three months, for after that time it rapidly loses its purgative property.

Directions for physicking will be found at p. 210. We will only add that, as a promoter of condition, the dose should always be mild. A few fluid stools will be sufficient for every good purpose. Violent disease will alone justify violent purging.

Three drachms of Barbadoes aloes will have as much purgative power as four of the Cape, exclusive of griping less and being safer. If the horse is well mashed, and carefully exercised, and will drink plenty of warm water, the Cape may be ventured on, or at least mixed with equal quantities of the Barbadoes; but if there be any neglect of preparation for physic, or during the usual operation of the physic, the Cape are not to be depended upon, and may be dangerous.

Some persons are fond of what are called half-doses of physic. Three or four drachms are given in one day, and three or four on the following, and perhaps, if the medicine has not operated, as in this divided state it will not always, two or three additional drachms are given on the third day. The consequence is, that the bowels having been rendered irritable by the former doses, the horse is over-purged, and inflammation and death not unfrequently ensue, when the effect of the three becomes combined. In physicking a horse, whatever is to be done should be done at once. Whatever quantity is intended to be given, should be given in one dose.

The system of giving small doses of aloes as alteratives is not good. These repeated small doses lodging in some of the folds of the intestines, and at length uniting, often produce more effect than is desirable; and it is never safe to ride a horse far or fast, with even a small dose of aloes within him.

Most of all objectionable is the custom of giving small doses of aloes as a nauseant, in inflammation of the lungs. There is so much sympathy between the contents of the chest and the belly of the horse, and inflammation of one part is so likely to be transferred to another, that it is treading on very dangerous ground, when, with much inflammation of the lungs, that is given which will stimulate and may inflame the intestines.

Aloes are most commonly, because most easily, administered in the form of ball, but in a state of solution their effect is more speedy, effectual, and safe. Two ounces of aloes, and one ounce of gum (to suspend the imperfectly dissolved portion of the aloes), are put into a pint of boiling water, and the mixture frequently stirred. When it is cold, two ounces of tincture are added, as an aromatic, to prevent the griping of the aloes, and also to keep the mixture from fermenting. The aloes must not be boiled in the water; even five minutes' boiling would take away much of the purgative effect of the drug. The dose of the solution should vary from six to eight ounces.

Aloes are useful in the form of tincture. Eight ounces of powdered aloes, and one ounce of powdered myrrh, should be put into two quarts of rectified spirit, diluted with an equal quantity of water. The mixture should be daily well shaken for a fortnight, and then suffered to stand, that the undissolved portion may fall to the bottom. This will constitute a very excellent application for wounds, whether recent or of long standing, and indisposed to heal. It is not only a gentle stimulant, but it forms a thin crust over the wound, and shields it from the action of the air.

The principal adulteration of aloes is by means of resin, and the alteration of colour is concealed by the addition of charcoal, or lamp black. This adulteration is easily enough detected, by dissolving the aloes in hot water. All aloes contain some resinous matter, which the water will not dissolve, and which has very slight purgative effect. The excess of this resin at the bottom of the solution will mark the degree of adulteration.

ALTERATIVES are a class of medicines the nature and effect of which are much misunderstood, and which are liable to much abuse. It is a very convenient name to excuse that propensity to dose the horse with medicines, which is the disgrace of the groom, and the bane of the stable. By alteratives we understand those drugs which effect some slow change in the diseased action of certain parts without interfering with the food or work; but by common consent the term seems to be confined to medicines for the diseases of the circulation, or of the digestive organs, or of the skin. If a horse is heavy and incapable of work from too good keep, or if he is off his food from some temporary indigestion—or if he has mange or grease, or cracked heels, or swelled legs, a few alteratives are prescribed, and the complaint is gradually and imperceptibly removed. For all skin affections there is no better alterative than that so often recommended in this treatise, consisting of black antimony, nitre, and sulphur. If there is any tendency to grease, two drachms of resin may be added to each ball. If the complaint be accompanied by weakness, a little gentian and ginger may be further added, but we enter our protest against the ignorant use, and almost against the use in the most skilful hands, of mercury in any form, or any of the mineral acids or mineral tonics, or heating spices, as alteratives. We indeed should be pleased if we could banish the term alterative altogether. The mode of proceeding which reason and science would dictate is to ascertain the nature and degree of the disease, and then the medicine which is calculated to restore the healthy action of the part, or, of the frame generally.

ALUM is occasionally used internally in cases of super-purgation in the form of alum-whey, two drachms of the powder being added to a pint of hot milk; but there are much better astringents, although this may succeed when others fail. If alum is added to a vegetable astringent, as oak-bark, the power of both is diminished. Its principal use is external. A solution of two drachms to a pint of water forms alone, or with a scruple of white vitriol, a very useful wash for cracked heels, and for grease generally; and also for those forms of swelled legs attended with exudation of moisture through the skin. Some add the Goulard lotion, forgetting the chemical decomposition that takes place; the result of which is, that the alumine, possessing little astringency, is detached, and two salts with no astringency at all, the sulphate of lead and the sulphate of potash, are formed.

The BURNT ALUM is inferior to the common alum for the purposes mentioned, and we have better stimulants, or caustics, to apply to wounds.

AMMONIA, is, to the annoyance of the horse, and the injury of his eyes and his lungs, plentifully extricated from the putrefying dung and urine of the stable; but, when combined with water in the common form of hartshorn, it is seldom used in veterinary practice. It has been given, and with decided benefit, and when other things have failed, in flatulent colic; and is best administered in the form of the aromatic spirit of ammonia, and in doses of one or two ounces, in warm water.

CHLORIDE OF AMMONIA, or sal ammoniac is scarcely deserving of a place in our list. It is not now used internally; and as an astringent embrocation, it must yield to several that are more effectual, and less likely to blemish.

ANODYNES. Of these there is but one in horse practice. Opium is the only drug that will lull pain. It may be given as an anodyne, but it will also be an astringent in doses of one, two, or three drachms.

ANTIMONY. There are several valuable preparations of this metal.

THE BLACK SULPHURET OF ANTIMONY, a compound of sulphur and antimony, is a good alterative. It is given with more sulphur and with nitre, in varying doses, according to the disease and the slow or rapid effect intended to be produced. The maximum dose, and especially if it is to be continued, should not exceed four drachms. It should never be bought in powder, whatever trouble there may be in levigating it, for it is often grossly adulterated with lead, manganese, forge-dust, and arsenic. The adulteration may be detected by placing a little of the powder on a red-hot iron plate. The pure sulphuret will evaporate without the slightest residue—so will the arsenic, but there will be an evident smell of garlic; a portion of the lead and the manganese will be left behind.

EMETIC TARTAR—the tartrate of potash and antimony, or a combination of super-tartrate of potash and oxide of antimony, is a very useful nauseant, and has considerable effect on the skin. It is particularly valuable in inflammation of the lungs, and in every catarrhal affection. It is given in doses of one drachm, or one drachm and a half, and combined with nitre and digitalis. It is also beneficial in the expulsion of worms. Here it must be given in doses of two drachms, and with some mechanical vermifuge, as tin-filings, or ground-glass, and administered on an empty stomach, and for several successive days. Although it may sometimes fail to expel the worm, it materially improves the condition of the horse, and produces sleekness of the coat. To a slight degree the emetic tartar is decomposed by the action of light, and should be kept in a jar, or green bottle. It is sometimes adulterated with arsenic, which is detected by the garlic smell when it is placed on hot iron, and also by its not giving a beautiful gold-coloured precipitate when sulphuret of ammonia is added to a solution of it.

ANTIMONIAL POWDER—Powder of oxide of antimony, with phosphate of lime. This is the factitious James's powder, and is used as a substitute for that medicine, in many diseases of a febrile character. The dose is from one to two drachms. The late Mr. Bloxam used to trust to it alone in the treatment of epidemic catarrh in the horse, and he was very successful. It is, however, decidedly inferior to the emetic tartar. This, too, is adulterated with chalk, and plaster of Paris, and burnt bones, and other white powders, and that to so shameful a degree, that little dependence can be placed on the antimonial powder usually sold by druggists. Muriatic or sulphuric acid will detect most of these adulterations.

Chloride of antimony is formed by distilling corrosive sublimate with antimony. The butter-like matter which is produced (whence the common name, *Butyr of Antimony*) has a strong affinity for water, which it attracts from the atmosphere, and thus becomes converted into a fluid. The less water it is suffered to attract to itself, the more powerful it remains, and therefore it should be kept in stopped bottles; and the proof of its goodness is its weight. It is decidedly the best liquid caustic we have; it is most manageable, and its effect can most readily be ascertained. As soon as it touches any muscular or living part, a change of colour is perceived on the part; and the effect of the caustic can be fairly judged of by the degree of change. For corns, canker, indisposition in the sole to secrete good horn, wounds in the foot not attended by healthy action, and for every case where the superficial application of a caustic is needed, the chloride of antimony is unrivalled.

Anti-spasmodics. Of these our list is scanty, for the horse is subject only to few spasmodic diseases, and there are fewer medicines which have an anti-spasmodic effect. Opium stands first for its general power, and that exerted particularly in locked jaw; and oil of turpentine as almost a specific for spasm of the bowels: camphor, assafœtida, and various others, used on the human subject, have very doubtful effect in the horse, or may be considered as almost inert.

Arsenic. Were it not that some practitioners continue to use it as a tonic, in doses of from ten to twenty grains daily, and others use it to core out old ulcers, we would not include it in our list, for we have little faith in it. There are better and safer tonics, and far better and safer caustics. The method of detecting the presence of arsenic, in cases of poisoning, has been described at page 200.

Astringents are medicines that contract the living fibres, and thus close the mouths of small vessels, and restrain inordinate and dangerous discharges. Opium, alum, and catechu are powerful astringents in arresting intestinal and urinary evacuations; and alum and the superacetate of lead are astringents applied externally.

Balls. The usual and the most convenient mode of administering many medicines is in the form of balls, compounded with oil, and not with honey or syrup, on account of their longer keeping soft and more easily dissolving in the stomach. Balls should never weigh more than an ounce and a half, or two ounces, otherwise they will be so large as to pass with difficulty down the gullet. They should not be more than an inch in diameter and three inches in length. The mode of delivering balls is not difficult to acquire; and the balling iron, while it often wounds and permanently injures the bars, occasions the horse to struggle more than he otherwise would against the administration of the ball. The horse should be backed in the stall;—the tongue should be drawn gently out with the left hand on the off-side of the mouth, and there fixed, not by continuing to pull at it, but by pressing the fingers against the side of the lower jaw. The ball, being now taken between the tips of the fingers of the right hand, is passed rapidly up the mouth, as near to the palate as possible, until it reaches the root of the tongue; it is then delivered with a slight jerk, and the hand being immediately withdrawn and the tongue liberated, the ball is forced through the pharynx into the œsophagus. Its passage should be watched down the left side of the throat; and if it is not seen going down, a slight tap or blow under the chin will generally cause the horse to swallow, or a few gulps of water will carry it down. If the gullet should be small, or strictured, and the ball should remain in some part of it, the method of removing it has been described in page 162.

Blisters are applications to the skin which separate the cuticle in the form of vesicles containing a serous fluid. They excite increased action in the vessels of the skin, by means of which this fluid is thrown out. The part or neighbouring parts are somewhat relieved by this discharge, but more by the inflammation and pain which are produced, and which lessen the inflammation and pain previously existing in some contiguous part. On this principle we account for the decided relief often obtained by blisters in inflammation of the lungs; their efficacy in abating deeply-seated inflammation, as that of sprain of the tendons, ligaments, or joints; and the necessity of removing first, in these latter cases, the superficial inflammation caused by the sprain, that inflammation of a different kind may be excited instead of it, to which the deeply-seated inflammation of the part will be more likely to yield. The blisters used in horse-practice are composed only of cantharides or the oil of turpentine, to which some have added a tincture of the Croton-nut. The method of forming the best blister is mentioned at page 186.

Bole Armenian is an argillaceous earth combined with iron, and is supposed to possess some astringent property. The propriety of its being best administered inwardly is doubtful; for it may remain in the intestinal canal, and become the nut of a stone. On account of its supposed astringency, it is employed externally to give consistence to ointments for grease. Even the bole Armenian has not escaped the process of adulteration, and is largely mixed with inferior earths. The fraud may be suspected, but not satisfactorily detected, by the colour of the powder, which should be a bright red.

Burgundy Pitch.—See Resin.

Calamine.—See Zinc.

Calomel.—See Mercury

Camphor is the produce of one of the laurus species, a native of Japan, and is imitated by passing a stream of chlorine through oil of turpentine. The efficacy of this drug when used internally is very doubtful. The camphor ball is a favourite with the groom, and occasionally administered by the veterinary surgeon, but, seemingly, with no definite object, for it has not been yet determined whether it is to be considered as a sedative, antispasmodic, or stimulant. It is, however, a stimulant, when applied externally. In the form of camphorated oil, it promotes the absorption of fluids thrown out beneath the skin, the removal of old callus, and the suppleing of joints stiff from labour. Combined with oil of turpentine it is more effective, but in that combination it occasionally blemishes.

Cantharides are the basis of the most approved and useful veterinary blisters. The cantharis is a fly, the native of Italy and the south of France, destroyed by sulphur, dried and powdered, and mixed with palm oil and resin, in the proportions directed at page 186. Its action is intense, and yet superficial; it plentifully raises the cuticle, but never injures the true skin, and therefore never blemishes. The application of other acrid substances is occasionally followed by deep-seated ulcerations; but a blister, composed of the Spanish fly alone, while it does its duty, leaves, after a few weeks have passed, scarcely a trace behind. The art of blistering consists in cutting, or rather shaving the hair perfectly close—

then well rubbing in the ointment, for at least ten minutes—and afterwards, and what is of the greatest consequence of all, plastering a little more of the ointment lightly over the part, and leaving it. As soon as the vesicles have perfectly risen, which will be in twenty or twenty-four hours, the torture of the animal may be somewhat relieved by the application of olive or neat's-foot oil, or any emollient ointment.

When too extensive a blister has been employed, or, from the intensity of the original inflammation, the blister has not risen, (for no two intense inflammations can exist in neighbouring parts at the same time,) strangury, or great difficulty in passing urine, or even suppression of it, has occurred. The careful washing off of the blister, and the administration of plenty of warm water, with opium, and bleeding if the symptoms run high, will generally remove this unpleasant effect.

An infusion of two ounces of the flies in a pint of oil of turpentine, for several days, is occasionally used as a liquid blister; and when sufficiently lowered with common oil, it is called a *sweating* oil, for it maintains a certain degree of irritation and inflammation on the skin, but not sufficient to blister, and thus gradually abates or removes some old or deep inflammation, or cause of lameness.

Cantharides have lately been recommended to be given internally, in doses, daily, or twice in the day, of five grains, and increasing the dose to fifteen grains, for the cure of glanders. The experiments are yet too few and indecisive to admit of any satisfactory conclusion. In these doses the fly has not been injurious, and the experiments are well worth prosecuting.

CARRAWAYS.—These and ginger are retained as the only cordials requisite for the horse.

CASTOR OIL is here introduced again to warn the horse-owner and the practitioner against the too frequent use of it. If it is a purgative in the horse, it must be given in the enormous and expensive doses of a pound or a pound and a half; even then it is uncertain in its effect—often gripes, and is unsafe and dangerous.

CATECHU, Japan earth, yet no earth, but extracted from the wood of one of the acacia trees, is a very useful astringent. It is given in superpurgation, in doses of one or two drachms, with one or one and a half drachm of opium, as a yet more powerful astringent; four drachms of chalk, to neutralize any acid in the stomach or bowels, and two drachms of powdered gum being also added, to sheath the over-irritated mucous coat of the intestines. It is not often adulterated in our country, but grossly so abroad—fine sand and aluminous earth being mixed with the extract. It should not be given with any alkali, yet the prescription just recommended contains chalk. But although the chalk, being an alkali, weakens the astringency of the catechu, it probably neutralizes some acid in the stomach or bowels, which would have diminished the power of the catechu to a greater degree. It must not be given in conjunction with any metallic salt, for the tannin or gallic acid, on which its power chiefly or entirely depends, has an affinity for all metals, and will unite with them, and form a gallate of them, possessing little astringent energy. Common ink is the union of this tannin principle with iron.

A tincture of catechu is sometimes made by macerating three ounces of the powder in a quart of spirit for a fortnight. It is very excellent for wounds; and, with the aloes, constitutes all that we want of a balsamic nature for the purpose of hastening the healing process of wounds.

CAUSTICS.—These are sometimes necessary to destroy fungous excrescences, or stimulate indolent ulcers, or remove portions of cellular substance or muscle infected by any poison. They are the butyr of antimony—blue vitriol—verdigris—corrosive sublimate—lunar caustic, and sulphuric acid. See these different substances.

Chalk is used only in combination with catechu for superpurgation, and in the proportions directed under the article Catechu. The prepared or levigated chalk is generally preferred.

Chamomile.—The powder of the flower is a useful vegetable tonic, and the mildest in our list. It is given in doses of one or two drachms, and is exhibited in the early stage of convalescence to ascertain whether the febrile stage of the disease is passed, and to prepare the way for a more powerful tonic, the gentian. If no acceleration of pulse, or heat of mouth, or indication of return of fever, accompanies the cautious use of the chamomile, the gentian, with carbonate of iron, may be safely ventured on ; but if the gentian had been used first, and a little too soon, there might have been a considerable, and perhaps dangerous return of fever.

Charcoal is a useful antiseptic, and, mixed with a poultice, readily removes the fœtid smell of unhealthy ulcers, or cracked heels.

Charges are thick adhesive plasters spread over parts that have been strained or weakened, and, being applied to the skin warm, adhere for a considerable time. The following mixture makes a good charge—Burgundy or common pitch, five ounces ; tar, six ounces ; yellow wax, one ounce, melted together, and when they are becoming cool, half a drachm of powdered cantharides well stirred in. This must be partially melted afresh when applied, and put on the part with a large spatula, as hot as it can be without giving the animal too much pain. Flocks of tow should be scattered over it while it is warm, and thus a thick and adhesive covering will be formed, which cannot be separated from the skin for many months. This is applied for old sprains of the loins, and also strains of the back sinews. The charge acts in three ways—by the slight stimulant power which it possesses it gradually removes all deep-seated inflammation—by its stimulus and by its pressure it promotes the absorption of any callus or thickening beneath ; and, acting as a constant bandage, it gives tone and strength to the part.

Clysters.—These are useful and too often neglected means of hastening the evacuation of the bowels, when the disease requires their speedy action. The old ox-bladder and wooden pipe may still be employed, and a considerable quantity of fluid may be thrown into the intestine; but the patent stomach and clyster-pump of Mr. Reid is far preferable, as enabling the practitioner to inject a greater quantity of fluid, and in a less time.

Two ounces of soft or yellow soap, dissolved in a gallon of warm water, will form a useful aperient clyster; it will detach or dissolve many irritating substances that may have adhered to the mucous coat of the bowels. For a more active aperient, eight ounces of Epsom salts, or even of common salt, may be dissolved in the same quantity of water: a more active injection, but not to be used if much purgative medicine has been previously given, may be composed of an ounce of Barbadoes aloes, dissolved in two or three quarts of warm water. If nothing else can be procured, warm water may be employed ; it will act as a fomentation to the inflamed and irritable surface of the bowels, and will have no inconsiderable effect even as an aperient.

In cases of over-purging or inflammation of the bowels, the injection must be of a soothing nature: it may consist of gruel alone ; or if the purging be great, and difficult to stop, the gruel must be thicker, four ounces of prepared or powdered chalk being well mixed with or suspended in it, with two scruples or a drachm of powdered opium.

No oil should enter into the composition of a clyster, except that linseed oil may be used for the expulsion of the ascarides, or needle-worms.

In epidemic catarrh, when the horse sometimes obstinately refuses to eat or to drink, his strength may be supported by nourishing clysters; but they should consist of thick gruel only, and not more than a quart should be administered at once, for a greater quantity would be returned soon after the pipe is withdrawn. Strong broths, and more particularly ale and wine, are dangerous ingredients; they may rapidly aggravate the fever, and should never be administered, but under the superintendence, or by the direction of a veterinary surgeon.

The principal art of administering a clyster consists in not frightening the horse. The pipe, well oiled, should be very gently introduced, and the fluid not too hastily thrown up; and its heat should be as nearly as possible that of the intestine, or about 96 degrees of Fahrenheit's thermometer.

Copper.—There are two combinations of this metal used in veterinary practice: the verdigris or subacetate, and the blue vitriol or sulphate.

Verdigris is the common rust of copper, produced by vinegar, or any thing sour, or even common salt. It is given internally by some practitioners, in doses of two or three drachms daily, as a tonic, and particularly for the cure of farcy. It is, however, an uncertain and dangerous medicine. The corrosive sublimate, with vegetable tonics, as recommended at page 130, is preferable. Verdigris is, however, usefully applied externally as a mild caustic. Either alone, in the form of fine powder, or mixed with an equal quantity of the sugar (superacetate) of lead, it eats down proud flesh, or stimulates old ulcers to healthy action; when boiled with honey and vinegar, it constitutes the farriers' Egyptiacum, certainly of benefit in cankered or ulcerated mouth, and no bad application for thrushes; but yielding, as it regards both, to better remedies, which have been mentioned under the proper heads. Some practitioners use alum and oil of vitriol in making their Egyptiacum, forgetting the strange decomposition which is produced.

Blue Vitriol—Is the union of sulphuric acid and copper; it is a very favourite tonic with many, and has been vaunted as a specific for glanders; while others, and we think properly, have no very good opinion of it in either respect. As a cure for glanders, its reputation is now nearly passed by; as a tonic, when the horse is slowly recovering from severe illness, it is dangerous, and its internal use should be confined to cases of long continued discharge from the nose, when catarrh or fever have ceased. It may then be given with benefit in doses of from one to two drachms twice in the day, but it should be combined with gentian and ginger. It is principally valuable as an external application, dissolved in water in the proportion of two drachms to a pint, and acts as a gentle stimulant; but when an ounce is dissolved in the same quantity of water it becomes a mild caustic. In the former proportion, it rouses old ulcers to a healthy action, and disposes even recent wounds to heal more quickly than they otherwise would do; and in the latter it removes fungous granulations or proud flesh. The blue vitriol is sometimes reduced to powder and sprinkled upon the wound for this purpose, and is a good application for canker in the foot.

Cordials are useful or injurious according to the judgment with which they are given. When a horse comes home thoroughly exhausted, and refuses his food, a cordial may be beneficial; it may rouse the stomach and the system, and may prevent cold and fever; but it is poison to the animal when administered after the cold is actually caught and fever begins to appear. More to be reprobated is the practice of giving *frequent* cordials, that, by their stimulus on the stomach, (the skin sympathising so much with the stomach,) a fine coat may be produced. The artificial excitement of the cordial soon becomes as necessary to enable the horse to do even common work, as is the excitement of the dram to sustain the animal spirits of the drunkard.

To recall the appetite of the horse slowly recovering from illness a cordial may sometimes be allowed; or to old horses that have been worked hard and used to these excitements when young; or to draught horses, that have exhibited slight symptoms of staggers, when their labour has been unusually protracted, and their stomachs left too long empty; or mixed with diuretic medicine, to fine the legs of the overworked and debilitated animal; otherwise they should never find a place in the stable, or be used at the discretion of the carter or the groom. The most harmless cordial if abused, and the best if given with discretion, is composed of four parts each of carraway powder and bruised raisins, and two each of ginger and palm oil, well beaten into a mass.

Corrosive Sublimate.—See Mercury.

Cream of Tartar.—See Superacetate of Potash.

Croton Tiglii.—The croton-nut has not been long introduced into veterinary practice, although it has been used from time immemorial by the inhabitants of India as a powerful purgative. An oil has been extracted from it, and used by the surgeon; the meal is adopted by the veterinarian. It is given in doses from a scruple to a half a drachm, and, from its acrid nature, in ball with an ounce of linseed meal. When it does operate, the effect is generally observed in six or eight hours, and the stools are profuse and watery, and the patient frequently griped. On account of its quick operation, it may be given in locked jaw and staggers; and also in dropsy of the chest or belly, from the watery and profuse stools it produces; but it is often uncertain in its operation, and its griping and the debility it occasions are serious objections to it as common physic. A turpentine tincture of the powdered nut makes an active blister; but not so effectual or so safe as the cantharides.

Diaphoretics, are medicines that increase the sensible and insensible perspiration of the animal. (See page 373.) These, as it regards the horse, are neither many nor powerful. Antimony in its various forms (see page 384), and sulphur, have some effect in opening the pores of the skin, and exciting its vessels to action, and especially when assisted by warmth of stable or clothing, and therefore useful in those diseases where it is desirable that some portion of the blood should be diverted from the overloaded, and inflamed, and vital organs of the chest, to the skin or the extremities; but the only diaphoretics on which much confidence can be placed, and especially to produce condition, are warm clothing and good grooming.

Digestives are applications to recent or old wounds, as mild stimulants to produce a healthy appearance and action in them, and to cause them more speedily to heal. A weak solution of blue vitriol is an excellent digestive; so is the tincture of aloes, and the tincture of myrrh. The best digestive ointment is one composed of three parts of the common calamine ointment (Turner's cerate) and one of common turpentine.

Digitalis.—The leaves of the common fox-glove, gathered about the flowering time, dried carefully in the dark, and powdered, and kept in a close black bottle, form one of the most valuable medicines in veterinary practice. It is a direct and powerful sedative, diminishing the frequency of the pulse, and the general irritability of the system, and acting also as a mild diuretic; it is therefore useful in every inflammatory and febrile complaint, and particularly in inflammation of the chest. It is usually given in combination with emetic tartar and nitre. The average dose would be one drachm of digitalis, one and a half of emetic tartar, and three of nitre, and repeated twice or thrice in the day. Digitalis seems to have an immediate effect on the heart, lessening the number of its pulsations; but lessening them in a singular manner, not by causing it to beat more slowly, but by producing certain intermissions or pauses in its action. When these become marked; when at every sixth or seventh beat, the pulsations are suspended, while two or three could be slowly counted, this is precisely the effect which is intended to be produced; and however ill the horse may appear to be, or however alarming this intermittent pulse may seem to the standers-by, from that moment the animal will begin to amend. The dose must then be diminished one-half, and in a few days it may be omitted altogether; but the emetic tartar and the nitre should be continued, even for some days after the practitioner deems it prudent to try the effect of mild vegetable tonics. There is no danger in the intermittent pulse thus produced; but there is much danger when the digitalis fails to produce any effect on the circulation. The disease is then too powerful to be arrested by medicine. Digitalis requires watching; but the only consequence to be apprehended from an over-dose, is, that the patient may be reduced a little too low, and his convalescence retarded for a day or two.

In the form of infusion or tincture, digitalis is very useful in inflammation of the eyes. It is almost equal in power to opium, and it may with great advantage be alternated with it, when opium begins to lose its power. The infusion is made by pouring a quart of boiling water on an ounce of the powder. A portion of the liquid should be introduced into the eye. Of the tincture one or two drops should be introduced. To form the tincture, three ounces of the digitalis should be added to a quart of spirit.

The infusion has been serviceable in mange; but there are better applications.

Diuretics constitute a useful, but much abused class of medicines. They stimulate the kidneys to secrete more than the usual quantity of urine, or to separate a greater than ordinary proportion of the watery parts of the blood; but the deficiency of water in the blood thus occasioned must be speedily supplied, or the healthy circulation could not be carried on, and it is generally supplied by the absorbents taking up the watery fluid in some part of the frame, and carrying it into circulation. Hence the evident use of diuretics in every dropsical affection, in swelled legs, and also in inflammation and fever, by lessening the quantity of the circulating fluid, and therefore the quantity which is sent to inflamed parts.

All this, however, is produced by the kidneys being stimulated to increased action, and if this stimulus is too often or too violently applied, the energy of the kidney may be impaired, or inflammation may be produced. That inflammation may be of an acute character, and destroy the patient; or, although not intense in its nature, it may by frequent repetition assume a chronic character, and more slowly, but as surely, do irreparable mischief. Hence the necessity of attention to that portion of the food which may have a diuretic power. Mow-burnt hay and foxy oats are the unsuspected causes of many a disease in the horse, at first obscure, but ultimately referable to injury or inflammation of the urinary organs. Hence, too, the impropriety of suffering medicines of a diuretic nature to be at the command of the ignorant carter or groom. In swelled legs, cracks, grease or accumulation of fluid in any part, and in those superficial eruptions and inflammations which are said to be produced by humours floating in the blood, diuretics are evidently beneficial; but they should be as mild as possible, and should not be oftener given or continued longer than the case requires. For some cautions as to the administration of diuretics, and a list of the safest and best, the reader is referred to page 215. The expensive Castile soap, and camphor, and so often resorted to, are not needed; the common liquid turpentine is quite sufficient in all ordinary cases, and nitre and digitalis may be added if fever is suspected.

Drinks.—Many practitioners and horse proprietors have a great objection to the administration of medicines in the form of drinks. A drink is not so portable as a ball, it is more troublesome to give, and a portion of it is usually wasted. If the drink contains any acid substance, it is apt to excoriate the mouth, or to irritate the throat already sore from disease, or the unpleasant taste of the drug may unnecessarily nauseate the horse. There are some medicines, however, which must be given in the form of drink, as in cholic, and the time, perhaps, is not distant when purgatives will be thus administered, as more speedy and safer in their operation. In cases of much debility and entire loss of appetite, all medicine should be given in solution, for the stomach may not have sufficient power to dissolve the paper in which the ball is wrapped, or the substance of the ball.

An ox's horn, the larger end being cut slantingly, is the usual and best instrument for administering drinks. The noose of a halter is introduced into the mouth, and then, by means of a stable fork, the head is elevated by an assistant considerably higher than for the delivery of a ball. The surgeon stands on a pail or stable basket on the off-side of the horse, and draws out the tongue with the left hand; he then with the right hand introduces the horn gently into the mouth, and over the tongue, and by a dexterous turn of the horn empties the whole of the drink into the back part of the mouth; the horn is now quickly withdrawn, and the tongue loosened, and the greater portion of the fluid must be swallowed. A portion of it however will often be obstinately held in the mouth for a long time, and the head must be kept up until the whole is swallowed, which a quick, but not violent slap in the muzzle will generally compel the horse to do. The art of giving a drink consists in not putting too much into the horn at once; introducing the horn far enough into the mouth, and quickly turning and withdrawing it, without bruising or wounding the mouth, the tongue being loosened at the same moment. A bottle is a disgraceful and dangerous instrument to use.

Elder.—The elder leaf, boiled in lard, forms an emollient ointment, usefully applied to inflamed and irritated parts.

Epsom Salts.—See Magnesia.

Fomentations open the pores of the skin and promote perspiration in the part, and so abate the local swelling, and relieve pain and lessen inflammation. They are often used, and with more effect when the inflammation is somewhat deeply seated, than when it is superficial. The effect depends on the warmth of the water, and not on any herb which may have been boiled in it. They are best applied by means of flannel, frequently dipped in the hot water, or on which the water is poured, and the heat should be as great as the hand will bear. The benefit that might be derived from them is much impaired by the absurd method in which the fomentations are conducted. They are rarely continued long enough, and when they are removed, the part is left wet and uncovered, and the coldness of evaporation succeeds to the heat of fomentation. The perspiration is thus suddenly checked, the animal suffers considerable pain, and more harm is done by the extreme change of temperature than if the fomentation had not been attempted.

Gentian stands at the head of the vegetable tonics, and it is a stomachic as well as a tonic. It is equally useful in chronic debility, and in that which is consequent on severe and protracted illness. It is generally united with chamomile, ginger, and, when the patient will bear it, carbonate of iron. Four drachms of gentian, two of chamomile, one of carbonate of iron, and one of ginger, will make an excellent tonic ball. An infusion of gentian is one of the best applications to putrid ulcers.

Ginger is as valuable as a cordial, as gentian is as a tonic. It is the basis of the cordial ball, and it is indispensable in the tonic ball. Although it is difficult to powder, the veterinary practitioner should always purchase it in its solid form. If the root be large, heavy, and not worm-eaten, the black ginger is as good as the white, and considerably cheaper. The powder is adulterated with bean-meal and the sawdust of boxwood, and rendered warm and pungent by means of capsicum.

Goulard's Extract.—See Lead.

Hellebore, White, is a powerful nauseant, and lowers both the force and the frequency of the pulse, and is therefore given with good effect in various inflammations, and particularly that of the lungs; but it requires watching. In the hospital of the veterinary surgeon, or in the stable of the gentleman who will superintend the giving and the operation of every medicine, it may be used with safety; but with him who has to trust to others, and who does not see the horse more than once in twelve or twenty-four hours, it is a dangerous drug. If it is pushed a little too far, trembling and giddiness, and purging follow, and the horse is sometimes lost. The hanging of the head, and the frothing of the mouth, and, more particularly, the sinking of the pulse, would give warning of danger; but the medical attendant may not have the opportunity of observing this, and when he does observe it, it may be too late. Its dose varies from a scruple to half a drachm. In doses of a drachm it could not be given with safety; and yet, such is the different effect of medicines given in different doses, that in the quantity of an ounce it is said to be a diuretic and a tonic, and exhibited with advantage in chronic and obstinate grease.

Hemlock is used by some practitioners, instead of digitalis or hellebore, in affections of the chest, whether acute or chronic; but it is inferior to both. The dose of the powder of the dried leaves is about a drachm.

Infusions.—The active matter of some vegetable substances is partly or entirely extracted by water. Dried vegetables yield their properties more readily and perfectly than when in their green state. Boiling water is poured on the substance to be infused, and which is previously grossly pounded or powdered; the vessel is then covered and placed by a fire. In five or six hours the transparent part may be poured off, and is ready for use. In a few days, however, all infusions become thick, and lose their virtue, from the decomposition of the vegetable matter.

The infusion of chamomile is advantageously used instead of water in compounding a mild tonic drench: the infusion of catechu is useful in astringent mixtures; the infusion of linseed is used instead of common water in catarrh and cold; and the infusion of tobacco in some injections.

Iodine.—This substance is but lately introduced into veterinary practice, and has been given with effect in doses of five grains daily, to reduce the enlarged glands which sometimes remain after catarrh. It has likewise power in reducing almost every species of tumour, and may be tried where it would be dangerous to use the knife.

IRON.—Of this metal there are two preparations adopted by veterinarians. The rust, or *Carbonate*, is a mild and useful tonic in doses from two to four drachms. The *Sulphate* (green vitriol or COPPERAS) is more powerful, but should never be given in early stages of recovery, and always with caution. The dose should be the same as that of the carbonate. The sulphate has lately been recommended for the cure of that deceitful stage or form of glanders, in which there is nothing to characterise the disease but a very slight discharge from the nostrils. It is to be dissolved in the common drink of the horse. It is worth a trial, but too sanguine expectations must not be encouraged of the power of any drug over this intractable malady. Iron should be given in combination with gentian and ginger, but never with any alkali or nitre, or soap or catechu, or astringent vegetable.

Forge water used to be a favourite tonic with farriers, and also a lotion for canker and ulcers in the mouth. It owes its power, if it has any, to the iron with which it is impregnated.

JUNIPER, OIL OF.—This essential oil is retained because it has some diuretic property, and is a pleasant aromatic. It may, therefore, enter into the composition of the diuretic ball.

LARD.—This or palm oil is far preferable to honey, or treacle, or syrups, for making up balls, because the ball more readily dissolves in the stomach. It likewise renders a purgative less liable to gripe. It is the principal basis of all ointments.

LAUDANUM.—See OPIUM.

LEAD.—Combinations of this metal are admitted into veterinary practice. The subacetate is common under the name of *Extract of Lead*, or *Goulard's Extract*. It is used in the proportion of a drachm to a pint of water in the early stages of inflammation of the eye; but is inferior both to the opium and digitalis, and cannot be used in combination with either. In double the proportion it is serviceable in superficial inflammations of various kinds, or in poultices for the feet where there is much inflammation or pain; but in cases of sprain, or deep injury, or inflammations, it is perfectly useless. If white vitriol or alum are added to the lead, the efficacy of all the ingredients is destroyed.

The *Sugar of Lead* is the acetate or superacetate of that metal. This, dissolved in water in the proportion of two drachms to a pint, makes an extemporaneous Goulard's Lotion, but not more valuable than the former.

White Lead (carbonate of lead) is sometimes sprinkled, in the form of fine powder, and with advantage, on swelled legs, where the skin is very red and irritable, and moisture is exuding through it. It is used alone or mixed with paste, or a bread-and-water poultice: but lead, although in the first-mentioned form a great favourite with many persons, might, without great loss, be expunged from the Veterinary Pharmacopœia.

LIME was formerly sprinkled over cankered feet and greasy heels, but there are less painful caustics, and more effectual absorbents of moisture. Lime water is rarely used, but the *Chloride of Lime* is exceedingly valuable. Diluted with twenty times its quantity of water, it should help to form the poultice applied to every part from which there is the slightest offensive discharge. The fœtid smell of fistulous withers, poll-evil, canker, and ill-conditioned wounds, is immediately removed, and the ulcers are more disposed to heal. When mangy horses are dismissed as cured, a washing with the diluted chloride will remove any infection that might lurk about them, or which they might carry from the place in which they have been confined. One pint of the chloride mixed with three gallons of water, and brushed over the walls and manger and rack of the foulest stable, will completely remove all infection. All horse furniture worn by a glandered or mangy animal will be effectually purified in the same way. Internally administered, it seems to have no power.

Liniments are oily applications of the consistence of a thick fluid, and designed either to sooth an inflamed surface, or, by gently stimulating the skin, to remove deeper-seated pain or inflammation. As an emollient liniment, one composed of half an ounce of extract of lead and four ounces of olive oil will be useful. For sprains, old swellings, or rheumatism, two ounces of hartshorn, the same quantity of camphorated spirit, an ounce of oil of turpentine, half an ounce of laudanum, and a drachm of oil of origanum, may be mixed together; or an ounce of camphor may be dissolved in four ounces of sweet oil, to which an ounce of oil of turpentine and a drachm of oil of origanum should be afterwards added. A little powdered cantharides, or tincture of cantharides, or mustard powder, will render either of these more powerful, or convert it into a liquid blister.

Linseed.—An infusion of linseed is often used instead of water, for the drink of the horse with sore-throat or catarrh. A pail containing it should be slung in the stable or loose box. Thin gruel, however, is preferable; it is as bland and soothing, and it is more nutritious. Linseed meal forms the best poultice for almost every purpose.

The oil of linseed is not a certain, but always a safe purgative. It must be given, however, in doses of a pint or a pint and a half.

Lotions.—Many of the best lotions have been already described, in the chapters which treat of the various diseases of the horse.

Magnesia.—The sulphate of magnesia, or Epsom Salts, should be used only in promoting the purgative effect of clysters, or, in repeated doses of six or eight ounces, gently to open the bowels at the commencement of fever. Some doubt, however, attends the latter practice; for the dose must often be thrice repeated before it will act, and then, although safer than aloes, it may produce too much irritation in the intestinal canal, especially if the fever be the precursor of inflammation of the lungs.

Mashes constitute a very important part of horse provender, whether in sickness or health. A mash given occasionally to a horse that is otherwise fed on dry meat prevents him from becoming dangerously costive. To the overworked and tired horse nothing is so refreshing as a warm mash with his usual allowance of corn in it. The art of getting a horse into apparent condition for sale, or giving him a round and plump appearance, consists principally in the frequent repetition of mashes, and from their easiness of digestion and the mild nutriment which they afford, as well as their laxative effect, they form the principal diet of the sick horse.

Mashes are made by pouring boiling water on bran, and stirring it well, and then covering it over until it is sufficiently cool for the horse to eat. If in the heat of summer a cold mash is preferred, it should, nevertheless, be made with hot water, and then suffered to remain until it is cold. This is not always sufficiently attended to by the groom, who is not aware that the efficacy of the mash depends principally on the change which is effected in the bran and the other ingredients by the boiling water rendering them more easy of digestion, as well as aperient. If the horse refuses the mash, a few oats may be sprinkled over it, in order to tempt him to eat it; but if it is previously designed that corn should be given in the mash, it should be scalded with the bran, to soften it and render it more digestible. Bran mashes are very useful preparatives for physic, and they are necessary during the operation of the physic. They very soon become sour, and the manger of the horse of whose diet they form a principal part, should be daily and carefully cleaned out.

When horses are weakly and much reduced, malt mashes will often be palatable to them and very nutritive : but the water that is poured on a malt mash should be considerably below the boiling heat, or the malt will be set, or clogged together. If owners were aware of the value of a malt mash, it would be oftener given when the horse is rapidly getting weaker from protracted disease, or when he is beginning to recover from a disease by which he has been much reduced. The only exception to their use is in cases of chest affection, in which they must not be given too early. In grease, and in mange accompanied by much emaciation, malt mashes will be peculiarly useful, and especially if they constitute a principal portion of the food.

MERCURY.—The *Mercurial Ointment* is prepared by rubbing quicksilver with lard, in the proportion of one part of mercury to three of grease, until no globules appear ; the practitioner should, if possible, prepare it himself, for he can neither get it pure nor of the proper strength from the druggist. It is employed with considerable advantage in preparing splents, spavins, or other bony or callous tumours, for blistering or firing. One or two drachms, according to the nature and size of the swelling, may be daily well rubbed in ; but it should be watched, for it sometimes salivates the horse very speedily. The tumours more readily disperse, at the application of the stronger stimulant, when they have been thus prepared. Mercurial ointment in a more diluted form is sometimes necessary for the cure of mallenders and sallenders ; and in very obstinate cases of mange, one-eighth part of mercurial ointment may be added to the ointment recommended at page 379.

Calomel, the submuriate or protochloride of mercury, may be given, combined with aloes, in mange, surfeit, or worms ; yet better alteratives and more efficient vermifuges have been described. It is admissible in some cases of chronic cough, in farcy, and in jaundice, but it is not a medicine that seems to agree with the horse. Alone it has little purgative effect, but it assists the action of other aperients. It is given in doses from a scruple to a drachm, but must not be too often or too long repeated. As soon as the gums become red, or the animal begins to quid or drop his hay, it must be discontinued.

Corrosive Sublimate, the oxymuriate or bichloride of mercury, combined with chlorine in a double proportion, is a useful tonic in farcy, and perhaps the most to be depended upon. It should be given in doses of ten grains daily, and gradually increased to a scruple, until the horse is purged, or the mouth becomes sore, when it may be omitted for a few days, and resumed. Some have recommended it as a diuretic, but it is too dangerous a medicine for this purpose. It is used externally in solution ; and in substance in quittor, as a stimulant to foul ulcers ; and in the proportion of five grains to an ounce of rectified spirit in obstinate mange or to destroy vermin on the skin. It is, however, too uncertain and too dangerous a medicine for the horse-proprietor to venture on its use without the sanction of a veterinary surgeon.

Æthiop's Mineral, the black sulphuret of mercury, is not often used in horse practice, but it is a good alterative for obstinate surfeit or foulness of the skin, in doses of three drachms daily. Four drachms of cream of tartar may be advantageously added to each dose.

MINT.—If the use of an infusion or decoction of this plant, or of the oil that is extracted from it, can be at any time admitted, it is as a vehicle in which the oil of turpentine and laudanum may be administered in cases of cholic.

Myrrh may be used in the form of tincture, or it may be united to the tincture of aloes as a stimulating and digestive application to wounds. Diluted with an equal quantity of water, it is a good application for canker in the mouth, but as an internal medicine it seems to be inert.

Nitre.—See Potash.

Nitrous Æther, Spirit of, is a very useful medicine in the advanced stages of fever, for while it to a certain degree rouses the exhausted powers of the animal, and may be denominated a stimulant, it never brings back the dangerous febrile action which was subsiding. It is given in doses of three or four drachms.

Oils.—The farrier's list contains many of them, but the scientific practitioner has discarded the greater part; those that are worth retaining will be found under the names of the vegetables from which they are extracted.

Ointments.—These have been fully described under the accidents and diseases in which their use is required.

Olives, Oil of.—This is sometimes given as a purgative when aloes or other aperients cannot be obtained. It is useless to give it in a less quantity than a pint, and then it is uncertain in its operation, although harmless. In all liniments and ointments, spermaceti, or even linseed oil, may be substituted without detriment, and the peculiar smell of the latter may be subdued by oil of aniseseed or origanum.

Opium.—However underrated by some, there is not a more valuable drug on our list. It does not often act as a narcotic except in enormous doses; but it is a powerful antispasmodic, sedative, and astringent. As an antispasmodic, it enters into the cholic drink, and it is the sheet anchor of the veterinarian in the treatment of tetanus or locked jaw. As a sedative, it relaxes that universal spasm of the muscular system, which is the characteristic of tetanus; and perhaps it is only as a sedative that it has such admirable effect as an astringent; for when the irritation about the mouths of the vessels of the intestines and kidneys is allayed by the opium, undue purging and profuse staling are necessarily arrested. It should, however, be given with caution. It is its secondary effect which is sedative, and, if given in cases of fever, its primary effect in increasing the excitation of the frame is marked and injurious. In the early and acute stage of fever, it would be bad practice to give it in the smallest quantity; but when the fever has passed, or is passing, there is nothing which so rapidly subdues the irritability that accompanies extreme weakness; and it becomes an excellent tonic, because it is a sedative.

If the blue or green vitriol, or cantharides, have been pushed too far, opium soonest quiets the disorder they have occasioned. It is given in doses of one or two drachms; either the powdered opium being made into a ball, or the crude opium dissolved in hot water, and given with its sediment. Other medicines are usually combined with it, according to the circumstances of the case.

Externally, it is useful in ophthalmia. In the form of decoction of the poppy head it may constitute the basis of an anodyne poultice; but it must not be given in union with any alkali, with the exception of chalk, in over-purging; nor with the superacetate of lead, by which its powers are materially impaired, nor with sulphate of zinc, or copper, or iron.

From its high price it is much adulterated, and it is rare to meet with it in a state of purity. The best tests are its smell, its taste, its toughness and pliancy, its fawn or brown colour, and its weight, for it is the heaviest of all the vegetable extracts, except gum arabic; yet its weight is often fraudulently increased by stones and bits of lead being concealed in it. The English opium is almost as good as the Turkish, and frequently sold for it; but is distinguishable by its blackness and softness.

Palm Oil, when genuine, is the very best substance that can be used for making masses and balls. It has a pleasant smell, and it never becomes rancid.

Pitch is used to give adhesiveness and firmness to charges and plasters. The common pitch is quite as good as the more expensive Burgundy pitch. The best plaster for sandcrack consists of one pound of pitch and an ounce of yellow bees-wax melted together.

Physic.—The cases which require physic, the composition of the most effectual and safest physic ball, and the mode of treatment under physic, have been already described at page 211.

Potash.—Two compounds of potash are used in veterinary practice. The Nitrate of Potash, *Nitre*, is a valuable cooling medicine, and a mild diuretic, and, therefore, it should enter into the composition of every fever ball. Its dose is from two to four drachms. Grooms often dissolve it in the water. There are two objections to this: either the horse is nauseated and will not drink so much water as he ought; or the salt taste of the water causes considerable thirst, and disinclination to solid food. Nitre while dissolving materially lowers the temperature of water, and furnishes a very cold and useful lotion for sprain of the back sinews, and other local inflammations. The lotion, however, should be used as soon as the salt is dissolved, for it quickly becomes as warm as the surrounding air. The Supertartrate of Potash, *Cream of Tartar,* is a mild diuretic, and, combined with Æthiop's mineral, is a useful alterative in obstinate mange or grease.

Poultices.—Few horsemen are aware of the value of these simple applications in abating inflammation, relieving pain, cleansing wounds, and disposing them to heal. They are fomentations of the best kind continued much longer than a simple fomentation can be. In all inflammations of the foot they are very beneficial, softening the horn, hardened by the heat of the foot, and contracted and pressing on the internal and highly sensible parts. The moisture and warmth are the useful parts of the poultice; and that poultice is the best for general purposes in which moisture and warmth are longest retained. Perspiration is most abundantly promoted in the part, the pores are opened, swellings are relieved, and discharges of a healthy nature procured from wounds.

Linseed meal forms the best general poultice, because it longest retains the moisture. Bran, although frequently used for poultices, is objectionable, because it so soon becomes dry. To abate considerable inflammation, and especially in a wounded part, Goulard may be added, or the linseed meal may be made into a paste with a decoction of poppy heads. To promote a healthy discharge from an old or foul ulcer; or separation of the dead from the living parts, in the process of what is called coring out; or to hasten the ripening of a tumour that must be opened; or to cleanse it when it is opened, two ounces of common turpentine may be added to a pound of linseed meal: but nothing can be so absurd, or is so injurious, as the addition of turpentine to a poultice that is designed to be an emollient. The drawing poultices and stoppings of farriers are often highly injurious, instead of abating inflammation.

If the ulcer smells offensively, two ounces of powdered charcoal may be added to the linseed meal, or the poultice may be made of water, to which a solution of the chloride of lime has been added in the proportion of half an ounce to a pound. As an emollient poultice for grease and cracked heels, and especially if accompanied by much unpleasant smell, there is nothing preferable to a poultice of mashed carrots with charcoal. For old grease some slight stimulant must be added, as a little yeast or the grounds of table beer.

There are two errors in the application of a poultice, and particularly as it regards the legs. It is often put on too tight, by which the return of the blood from the foot is prevented, and the disease is increased instead of lessened; or it is too hot, and unnecessary pain is given, and the inflammation aggravated.

Powders.—Some horses are very difficult to ball or drench, and the violent struggle that would accompany the attempt to conquer them may heighten the fever or inflammation. To such horses powders must be given in mashes. Emetic tartar and digitalis may be generally used in cases of inflammation or fever; or emetic tartar for worms; or calomel and even the farina of the Croton nut for physic: but powders are too often an excuse for the laziness or awkwardness of the carter or groom. The horse frequently refuses them, especially if his appetite has otherwise begun to fail; the powder and the mash are wasted, and the animal is unnecessarily nauseated. All medicine should be given in the form of ball or drink.

Raking.—This consists in introducing the hand into the horse's rectum, and drawing out any hardened dung that may be there. It may be necessary in costiveness or fever, if a clyster pipe cannot be obtained; but an injection will better effect the purpose, and with less inconvenience to the animal. The introduction of the hand into the rectum is, however, useful to ascertain the existence of stone in the bladder, or the degree of distention of the bladder in suppression of urine, for the bladder will be easily felt below the gut; and at the same time by the heat of the intestine, the degree of inflammation in it or in the bladder may be detected.

Resin.—The yellow resin is that which remains after the distillation of oil of turpentine. It is used externally to give consistence to ointments, and to render them slightly stimulant. Internally it is a useful diuretic, and is given in doses of five or six drachms made into a ball with soft soap. The common liquid turpentine is, however, preferable.

Rowels.—The manner of rowelling has been described at page 186. As exciting inflammation on the surface, and so lessening that which had previously existed in a neighbouring, but deeper-seated part, they are decidedly inferior to blisters, for they do not act so quickly nor so extensively; therefore they should not be used in acute inflammation of the lungs or bowels, or any vital part. When the inflammation, however, although not intense, has long continued, rowels will be serviceable by producing an irritation and discharge which can be better kept up than by a blister. As promoting a permanent, although not very considerable discharge and some inflammation, rowels in the thighs are useful in swelled legs, and obstinate grease. If fluid is thrown out under the skin in any other part, the rowel acts as a permanent drain. When sprain of the joint or the muscles of the shoulders is suspected, a rowel in the chest will be serviceable. The wound caused by a rowel will readily heal, and with little blemish, unless the useless leather of the farrier has been inserted.

Salt, common.—See Soda.

Sedatives are medicines which subdue irritation, repress spasmodic action, or deaden pain. We will not inquire whether they act first as stimulants; if they do, their effect is exceedingly transient, and is quickly followed by depression and diminished action. Digitalis, hellebore, opium, turpentine, are medicines of this kind. Their effect in different diseases, or stages of disease, and the circumstances which indicate the use of any one of them in preference to the rest, are considered under their respective titles.

Silver.—One combination only of this metal is used, and that as a manageable and excellent caustic, viz. the *Lunar Caustic.* It is far preferable to the hot iron, or to any acid, for the destruction of the part, if a horse should have been bitten by a rabid dog; and it stands next to the butyr of antimony for the removal of fungus generally.

Soda.—The *Chloride of Soda* is not so efficacious for the removal of unpleasant smells and all infection, as the chloride of lime, but it is exceedingly useful in changing malignant and corroding and destructive sores into the state of simple ulcers, and in ulcers that are not malignant it much hastens the cure. Poll evil and fistulous withers are much benefited by it, and all farcy ulcers. It is used in the proportion of one part of the solution to twenty-four of water.

Common Salt (Chloride of Sodium) is very extensively employed in veterinary practice. It forms an efficacious aperient clyster; a solution of it has even been given as an aperient drink. Sprinkled over the hay, or in a mash, it is very palatable to sick horses; and in that languor and disinclination to food which remain after severe illness, few things will so soon recall the appetite as a drink composed of eight ounces of salt in solution. To horses in health it is more useful than is generally imagined, as promoting the digestion of the food, and, consequently, condition. Externally applied, there are few better lotions for inflamed eyes than a solution of half a drachm of salt in four ounces of water. In the proportion of an ounce of salt to the same quantity of water, it is a good embrocation for sore shoulders and backs; and if it does not always disperse warbles and tumours, it takes away much of the tenderness of the skin.

Soap is supposed to possess a diuretic quality, and therefore enters into the composition of some diuretic masses. See Resin. By many practitioners it is made an ingredient in the physic ball, but uselessly or even injuriously so; for if the aloes are finely powdered and mixed with palm oil, they will dissolve readily enough in the bowels without the aid of the soap, while the action of the soap on the kidneys will impair the purgative effect of the aloes.

Starch may be substituted with advantage for gruel in obstinate cases of purging, both as a clyster, and to support the strength of the animal.

Stoppings constitute an important, but too often neglected part of stable management. If a horse is irregularly or seldom worked, his feet are deprived of moisture; they become hard, and unyielding, and brittle, and disposed to corn, and contraction, and founder. The very muck of a neglected and filthy stable would be preferable to habitual standing on the cleanest litter without stopping. In wounds, and bruises, and corns, moisture is even more necessary, to supple the horn, and relieve its pressure on the tender parts beneath. As a common stopping, nothing is better than cow-dung with a fourth part of clay beaten well into it, and confined with splents from the binding of the broom, or the larger twigs of the broom. In cases of wounds a little tar may be added; but tar, as a common stopping, is too stimulating and drying. Pads made of thick felt have lately been contrived, which are fitted to the sole, and, swelling on being wetted, are sufficiently confined by the shoe. Having been well filled with water, they will continue moist during the night. They are very useful in gentlemen's stables; but the cow-dung and clay are sufficient for the farmer.

Sulphur is the basis of the most effectual applications for mange.

It is an excellent alterative, combined usually with antimony and nitre, and particularly for mange, surfeit, grease, hidebound, or want of condition; and it is a useful ingredient in the cough and fever ball. When given alone, it seems to have little effect, except as a laxative in doses of six or eight ounces; but there are much better aperients. The black sulphur consists principally of the dross after the pure sulphur has been separated.

Tar melted with an equal quantity of grease forms the usual stopping of the farrier. It is a warm or slightly stimulant, and therefore useful, dressing for bruised or wounded feet; but its principal virtue seems to consist in preventing the penetration of dirt and water to the wounded part. As a common stopping it has been stated to be objectionable. From its warm and drying properties it is the usual and proper basis for thrush ointments; and from its adhesiveness, and slightly stimulating power, it often forms an ingredient in applications for mange; some practitioners give it, and advantageously, mixed with the usual cough medicine, and in doses of two or three drachms for chronic cough. The common tar is as effectual as the Barbadoes for every veterinary purpose. The oil, or spirit (rectified oil) of tar is sometimes used alone for the cure of mange, but it is not to be depended upon. The spirit of tar, mixed with double the quantity of fish oil, is, from its peculiar penetrating property, one of the best applications for hard and brittle feet. It should be well rubbed with a brush, both on the crust and sole, every night.

Tinctures.—The medicinal properties of many substances are extracted by spirit of wine, but in such small quantities as to be scarcely available in veterinary practice for internal use. So much aloes or opium must be given to produce effect on the horse, that the quantity of spirit necessary to dissolve it would be injurious or might be fatal. As applications to wounds or inflamed surfaces, the tinctures of aloes, digitalis, myrrh, and opium, are highly useful.

Tobacco, in the hands of the skilful veterinarian, may be advantageously employed in cases of extreme costiveness, or dangerous cholic; but should never be permitted to be used as an external application for the cure of mange, or an internal medicine to promote a fine coat.

Tonics are valuable medicines when judiciously employed; but, like cordials, they have been fatally abused. Many a horse recovering from severe disease has been destroyed by their too early, or too free use. The veterinary surgeon occasionally administers them injuriously, in his anxiety to gratify the impatience of his employer. The mild vegetable tonics, chamomile, gentian and ginger, and, perhaps, the carbonate of iron, may sometimes be given with benefit, and may hasten the perfect recovery of the patient; but there are few principles more truly founded on reason and experience, than that disease once removed, the powers of nature are sufficient to re-establish health. Against the more powerful mineral tonics, except for the particular purposes that have been pointed out under the proper heads, the horse proprietor and the veterinarian should be on his guard.

Turpentine.—The common liquid turpentine has been described as one of the best diuretics, in doses of half an ounce, and made into a ball with linseed meal and half a drachm of ginger. It is added to the calamine or any other mild ointment to render it stimulating and digestive, and from its adhesiveness and slight stimulating power, it is an ingredient in mange ointments. The oil of turpentine is an excellent antispasmodic. For the removal of cholic it stands unrivalled. (See page 206.) Forming a tincture with cantharides, it is the basis of the 'sweating blister,' used for old strains and swellings. As a *blister* it is far inferior to the common ointment; as a stimulant frequently applied it must be sufficiently lowered, or it may blemish.

VINEGAR is a very useful application for sprains and bruises. Equal parts of boiling water and cold vinegar will form a good fomentation. Extract of lead, or bay salt, may be added with some slight advantage. As an internal remedy, vinegar is rarely given, nor has it, except in very large doses, any medicinal power. The veterinarian and the horse-owner should manufacture their own vinegar. That which they buy may contain sulphuric acid, and pungent spices, and irritate the inflamed part to which it is applied.

WAX.—The yellow wax is used in charges and some plasters to render them less brittle.

ZINC.—The impure carbonate of zinc, under the name of *Calamine Powder*, is used in the preparation of a valuable healing ointment. Five parts of lard and one of resin are melted together, and when these begin to get cool, two parts of the calamine, reduced to an impalpable powder, are stirred in. The calamine is sometimes sprinkled with advantage on cracked heels, and superficial sores.

The sulphate of zinc, *White Vitriol*, in the proportion of three grains to an ounce of water, is an excellent application in ophthalmia, when the inflammatory stage is passing over; and quittor is most successfully treated by a saturated solution of white vitriol being injected into the sinuses. A solution of white vitriol of less strength forms a wash for grease that is occasionally useful, when the alum or blue vitriol does not appear to succeed.

ON DRAUGHT.

The investigation of the subject of draught by animal power, to which this treatise is devoted, and which will form an appropriate supplement to an account of the Horse,—has long and frequently occupied the attention of theoretical and practical men; so much so, that our object will be to collect what has been said and done, and, by arranging it methodically, to show in what manner the information may be applied and rendered useful, rather than to attempt to produce anything absolutely new upon the subject. Notwithstanding, however, all that has been written, if we open any of the authors who have treated the subject, in the hopes of obtaining direct practical information, we shall be much disappointed.

It might have been expected that the particular result of every method known and in use for the conveyance of a load from one spot to another, by animal power, whether by sledges, by wheel-carriages, or by water, as in canals, being so constantly and necessarily a matter of practical experiment, would have been accurately known and recorded;—but the contrary is too much the case.

The theoretical investigations have been made with too little reference to what really takes place in practice; and the practical portion of the subject has not generally been treated in that useful and comprehensive manner which it deserves and demands.

In fact, there is hardly a question in practical mechanics on which, though much has been written, opinions are apparently less fixed; or on which the information we do possess is in a less defined and available state.

One great object of research has been the average force of traction or power of a horse.

If we consult the most approved authors and experimentalists, Desaguilliers, Smeaton, &c., we find this power variously stated as equal to 80lbs., 100lbs, 150lbs., and even 200lbs: we are therefore left almost as ignorant as before; but the knowledge of this average power is fortunately of little or no use in practice. It is the application and effect of that power which alone is useful; and that is governed by circumstances always varying and dissimilar, such as the form and state of the road, the structure of the carriage, the size and friction of the wheels, &c. &c.; and scarcely any two cases of draught would, as regards the effect of the power of the horse, present precisely the same result.

The difference of opinion here manifest is still more remarkable when existing on a purely practical question.

In the inquiries instituted by a committee of the House of Commons in 1806 and 1808, on the subject of roads and carriages, two well-informed practical men, Mr. Russel, of Exeter, and Mr. Deacon, of Islington, the most extensive carriers in England, were examined upon an important question, viz., the advantage or disadvantage of a particular form of wheel. It was stated by one that, having given the wheels in question a twelvemonth's trial, he found that they tended to injure the road and increase the draught in the proportion of four to five; while it was stated by the other, who had also made the experiment on a large scale, that he found they materially assisted in keeping the roads in repair, and diminished the draught in the proportion of five to four.

Amidst such conflicting and contradictory opinions, it would appear difficult to come to any useful conclusion, and we might naturally be disposed to adopt a very common practice, that of taking an average result.

A little consideration, however, will show that these apparent discrepancies and contradictions arise, in great measure, from attempting to generalise and apply to practice the results of experiments made in, and therefore applicable only to, particular cases.

The results of experiments thus made at various times and places, and without that identity of condition and circumstance so necessary when standard rules are to be deduced from them, have, nevertheless, been used for that purpose; and this circumstance, combined with the various and distinct points to be considered before we can estimate accurately what even constitutes draught, will perhaps account for the disagreement amongst the practical and scientific authorities alluded to on the subject.

We must therefore examine severally all these points; and then, by considering their relative bearing upon each other, we may hope to reconcile the different opinions advanced, without which we cannot collect from them any information which will lead us to a practical and beneficial result.

We shall proceed to divide the subject under separate and distinct heads, and under each head to examine the methods or means now in use, or which have been proposed, and endeavour to estimate their comparative advantages by availing ourselves of what is already written and known upon each.

It will be necessary first, however, to explain and define clearly some terms which will occur frequently in the course of this paper, and especially the word 'draught,' which is the title itself of the treatise.

This word is used in such a very general and vague sense, that it would be difficult, if not impossible, to give an explanation which should apply equally to all its different meanings.

In the expression draught by animal power, it would seem to mean the action itself of drawing, while, on the other hand, it is frequently used to signify the amount of power employed, also the degree of resistance, as when we say the draught of a horse, or the draught of a carriage. Draught power is also an expression used. We shall, however, in the course of this treatise, confine our use of the word to the two meanings—*draught*, the action of dragging—and *draught*, the resistance to the power employed to drag any given weight.

Force of traction is another expression requiring explanation; but here we must enter into more detail, and shall give at once a practical illustration of our meaning.

A force is most conveniently measured by the weight which it would be capable of raising; but it is not therefore necessarily applied vertically, in which direction weight or gravity acts.

If a weight of 100lbs. be suspended to a rope, it is clearly exerting upon this rope a force of 100lbs.; but if the rope be passed over a pully void of friction, and continued horizontally, or in any other direction, and then attached to some fixed point, the weight still acts upon all parts of this rope, and consequently upon the point to which it is fixed, with a force equal to 100lbs: and so inversely, if a horse be pulling at a rope with a force which, if the rope were passed over a pully, would raise 100lbs., the force of traction of the horse is in this case 100lbs. Spring steelyards being now commonly in use, we may be permitted to refer to them as affording another clear exemplification of our meaning. In pulling at a steelyard of this description, whether the force be exerted horizontally or vertically, the index will, of course, show the same amount; and, consequently, if the strength of the horse be measured by attaching the traces to one of these steelyards, the number of pounds indicated on the dial will be the exact measure of the strain the horse exerts, and the amount of strain is called his 'force of traction.'

Having fixed as nearly as possible the meaning of these terms, which will frequently occur in the course of our progress, we shall proceed to the division of the subject.

It is evident that there are three distinct agents and points of consideration in the operation of draught, which are quite independent of each other. They are—First, the moving power and the mode of applying it; Secondly, the vehicle for conveying the weight to be moved; Thirdly, the canal, road, or railway, or what may be generally termed the channel of conveyance.

All these individually influence the amount of draught, and require separate consideration; but the mode of combining these different agents has also a material effect upon the result: consequently, they must be considered in relation to each other; and to obtain the maximum useful effect, with the greatest economy, in the employment of any given power, it is evidently necessary that these different agents should not only each be the best adapted to its purpose, and perfect to the greatest possible degree, but also that they should all be combined to the greatest advantage.

We shall proceed at once, then, to examine the different agents now employed, the modes of applying them, and the proportionate effects produced.

And, first, with regard to the species of moving power;—

This may be of two kinds, animal and mechanical.

By animal power we mean the direct application of the strength of any animal to dragging or pulling, as in the simple case of a horse dragging a cart. By mechanical, the application of any power through the intervention of machinery; the source of power in this latter case may, however, be animal strength, or a purely mechanical agent, as a steam-engine.

The latter is the only species of mechanical power which it has been attempted to apply practically to locomotion; and therefore that alone we propose to compare with the animal power.

Now, although these two powers, viz., simple animal power and the steam-engine, may in most instances be applied so as to produce the same effect, and may, therefore, to a superficial observer appear similar, yet there do exist such essential differences in the mode of action, or the means by which the effect is produced, that there are many cases in which the one may be used, wherein the other may be totally inapplicable.

In this treatise, draught by animal power is indeed the principal object of consideration; but as, at the present moment, there appears to be a great effort making to supersede animal power entirely by mechanical,—to dismiss our old servant, the horse, and supply his place by the steam-engine, it may be as well, in justice to the former, to say a few words in his defence, and to take a rapid and general view of the distinguishing features of the two agents.

To enter into all their respective merits, and to weigh their comparative advantages under all circumstances, would involve us in many questions foreign to our immediate point of consideration, and would embrace subjects which may supply matter for future consideration well worthy of our attention. It is sufficient for our present purpose to show that there still exist great objections to the universal application of machinery to draught, objections which do not equally apply to the use of animal power; and on the other hand, that there are many advantages in the latter, which are not yet obtained by the former; and that animal power continues, for all the ordinary purposes of traffic upon *common roads*, to be the most simple in its application, and certain in its effect.

We shall confine ourselves particularly to the consideration of that part of the question which relates to the slow transport of heavy goods, as being the most important branch of the subject, especially for agricultural purposes. Economy is, of course, the grand desideratum in the consideration of this question; consequently, the comparative expense of the two powers, supposing them for the moment equally convenient and applicable, will first demand our attention.

A difficulty arises here, however, from the want of a certain measure of comparison. The power of a one-horse engine is by no means exactly the same thing as that of a horse. As we have before stated, the mode of applying them being different, the variations in the results are different, and consequently the effects do not bear a constant proportion to each other, under different circumstances; we must therefore be careful not to fall into the mistake which we have ourselves pointed out as a very common source of error, viz., the drawing general conclusions from data obtained in a particular case. We shall take the power of the horse, and that of the steam-engine as ascertained practically on railways, where the effect of each is less influenced by accidental circumstances, and consequently can be better ascertained than on a road. We shall confine our calculations of expense to this particular case, and then endeavour to discover how far the same results are to be expected, or what modifications are likely to take place, and what alterations are to be made in the results under different circumstances. As regards the first, viz., the comparative cost of animal and mechanical power on a railway, we cannot do better than quote the words of the late Mr. Tredgold upon this subject, and we accordingly extract the following from his work upon Railways:—

'The relative expense of different moving powers for railways is an
'interesting inquiry, and the same materials being necessary to estimate
'the absolute expense for any time or place, it is desirable to give some
'particulars, to aid the researches of those who wish to make such comparative estimates. The annual expense of a horse depends on—

'1. The interest of purchase-money
'2. Decrease of value.
'3. Hazard of loss.
'4. Value of food.
'5. Harness, shoeing, and farriery.
'6. Rent of stabling.
'7. Expense of attendance.

'According to the average duration of a horse in a state fit for labour,
'of the description required on a railway, the first three items may be
'estimated at one-fourth of the purchase-money; the food, harness, shoe-
'ing, &c., included in the 4th, 5th, and 6th, will most likely not exceed
'40*l*. per annum, nor yet be much short of that amount; and supposing
'one man to attend to two horses, this would add 15*l*. 12*s*. if the man's wages

were 2*s*. per day; and, at this rate, the labour of a horse of the value of 20*l*. would cost 60*l*. 12*s*. per year; or, since there are 312 working days in the year, the daily expense would be 3*s*. 10½*d*., or 186 farthings. But the power of a horse is about 125lbs. when travelling at the rate of three miles per hour, and the day's work eighteen miles.

'The annual expense of a high-pressure locomotive engine, or steam carriage, consists of—

'1. The interest of the first cost.
'2. Decrease of value.
'3. Hazard of accidents.
'4. Value of coals and water.
'5. Renewals and repairs.
'6. Expense of attendance.

'It is difficult to procure these particulars from the experience of those who employ engines; we will therefore annex, by way of example, such sums as we think likely to cover the expense. The first cost of the engine and its carriage may be stated at 50*l*. per horse power, and its decrease of value and hazard will render its annual expense about one-fifth of its first cost, or 10*l*. per annum per horse power. The expense of fuel and water per day will be not less than one bushel and a half of coals per horse power, and fourteen cubic feet of water; and, taking the coals at 6*d*. per bushel, and the water and loading with fuel at 3*d*., the annual expense will be 15*l*. 12*s*.; the renewals and repairs, at 20 per cent. on the first cost, will be 10*l*., which is as little as can be expected to cover them. Attendance, suppose one man and one boy for each six-horse engine, at 6*s*. per day, or 1*s*. per day for each horse power, or 15*l*. 12*s*. per annum; therefore the total annual expense of one-horse power would be 51*l*. 4*s*., or 158 farthings per day.' This power is equal to a force of traction of 166⅔lbs. for the same number of miles per day as the horse; but from this gross amount of power we must deduct that necessary to move the engine with its supply of coals: this will reduce it at least to 155lbs.; consequently, in the one case we have a force of traction of 125lbs., at an expense of 186 farthings, and, in the other, a force of 155lbs. at an expense of 158 farthings; and reducing them both to one standard quantity of work done, we find the expense of the horse is $\frac{186}{125}=1.488$, and of the locomotive engine 1.019, or about as 147 is to 100. In this case, therefore, there appears to be a decided economy in the use of the steam-engine, and accordingly its application has become very general, and is becoming more so every day.

Let us now examine what alterations are requisite, before we can apply these calculations to the case of draught upon common roads. Supposing both species of power equally convenient and applicable, and confining our observations merely to the amount of power and proportionate expense.

The force of traction of the horse, and the yearly cost, will remain so nearly the same, that for our present purpose we may consider them quite unaltered. Not exactly so with the locomotive engine.

All the parts of the machine must be made much stronger and heavier, and consequently more expensive for road work than for a railway, and, therefore, the first cost will be greater—the wear and tear will also be greater, and as the work will be more variable, the consumption of fuel will be increased as well as the price, which, generally speaking, will be much less on a line of railway, than it can possibly be elsewhere.

Still all these circumstances will not influence the result so much as the increased effect of the weight of the engine. On a railway with the carriage, as now constructed, the force of traction is not much more than $\frac{1}{150}$ or $\frac{1}{200}$ of the weight moved; consequently, the power necessary to move the engine itself is not very considerable. On a road, however, this proportion is materially altered; here the average force required to move a well-constructed carriage cannot be estimated in practice, at less, even when the roads are in good repair, than $\frac{1}{25}$; the engine, according to the construction of the best locomotive engines now in use, will weigh, with its carriage and fuel, at least one-half ton, or 1120lbs. per horse power, and $\frac{1}{25}$ of 1120 is nearly 45lbs., which we have to deduct from the gross power of the engine, and which leaves only $121\frac{2}{3}$lbs. as the available power. The proportional expense of the horse and the steam-engine is now therefore about as 115 to 100, and this without taking into account the causes of increased expenditure already alluded to as regards the prime cost, the repairs, and the consumption of fuel. From these calculations it would appear, that even if mechanical power was found as convenient and applicable in practice as horse power, still no great economy can be expected from the employment, upon common roads, of small locomotive engines, such as the best of those now in use, and known to the public, unless it be in cases where other means may fail to produce some particular effect which may be required; if, for instance, a considerable velocity is necessary, the power of a horse is very nearly exhausted in moving his own body, and then there can be no doubt that a mechanical agent, in which power may always be exchanged for a proportional velocity, will have some advantages on a very good road which in fact approaches very nearly to a railway. But in every case in which velocity is not a principal object, as in the one now under consideration, and where, consequently, little momentum is acquired, and frequent though slight obstructions occur, as on an ordinary road, an animal appears to possess decided advantages. He adapts himself admirably to the work, increasing or diminishing his efforts according to the variations of the draught, resting himself, as it were, and acquiring vigour where his utmost strength is not called for, and thus becomes enabled to make exertions far beyond his *average* strength where any impediment or obstruction is to be overcome. Indeed, he appears rather to increase the *average effect of his powers* by these alternations of exertion and comparative relaxation; and when it is considered that the draught will, in an ordinary road, frequently vary in the proportion of six or eight to one, and that these changes may succeed each other suddenly, the importance of such an accommodating faculty will be immediately appreciated.

By mechanical power, such as a steam-engine affords, these advantages are not easily obtained. Without great weight or rapid motion no momentum can be acquired; and the carriage itself, not being in rapid motion, and the necessary economy in weight precluding the use of a fly-wheel, any small obstruction will check, and perhaps totally stop the machine. For instance, supposing the carriage to be advancing steadily under the effect of a force of traction of 500lbs., and that a stone or rut suddenly causes a resistance, which it would require 600 or 800lbs. to overcome, a case by no means rare even on tolerable roads; if the impetus or momentum of the mass be not sufficient to carry it over this obstruction, the machine must stop until some increased power be given to it.

It is also to be remembered, that what we are accustomed, in practice, to consider as the average power of a horse, is the average excess remaining over and above that necessary to carry his own body; and that in all ordinary cases he is able to maintain and continue nearly the same exertions, although the comparative draught of the carriage be considerably increased. Thus, if the road be slightly muddy or sandy, or newly gravelled, the draught, as we shall see more accurately laid down when we come to the subject of wheeled carriages, will be double and even treble what it is on the same road when freed from dust or dirt; but the average power of the horse remains nearly the same, and, practically speaking, equal under both circumstances; that is to say, that the power necessary to move the weight of the horse's body, which forms no inconsiderable portion of his whole power, is not materially increased by a state of road which will even treble the draught of the carriage; consequently, the excess, or available portion of his power, remains unimpaired, and the full benefit of it, as well as of any increased exertions of the animal, is felt and is applied solely to dragging the load.

Not so with a locomotive steam-engine, because beyond the power necessary to perform the work of dragging the load, an additional power must be provided to move the engine itself. In other words, if an engine of ten-horse power be capable of dragging a certain load, the weight of this engine forming a portion of the load to be moved, a corresponding portion of the power is unprofitably absorbed in moving it, and the excess, or remaining power, is alone available for useful purposes, and can alone be compared to the animal or horse power. Now, if the draught is augmented, as we have just supposed, by any sand, dirt, or roughness of the road, or any other impediment, the force required to move the useless weight (of the engine) is proportionally increased; it may even, as we have stated, be doubled or trebled; and the whole power of the engine remaining the same, the surplus or remaining portion is considerably diminished, and that at the very moment when, as before stated, it produces only one half or one-third the effect.

Moreover, if at any part of the road a power equal to twenty horses is required, the engine, as regards its construction, must be a 20-horse engine. It is erroneous to suppose that a steam-engine, because it is a high-pressure engine, can therefore, as occasion requires, be worked for any length of time beyond its nominal power, by merely raising the steam. Every part of a machine is calculated and arranged for a certain pressure and corresponding power, and that is the real power of it. It is optional to work at or below that power, but, if below, it will be to a disadvantage, and the bulk and weight of the machine will be as great as if it were always worked to its full extent, and both have to be carried over all those parts of the road where a far less power would be sufficient. The velocity of the carriage might indeed be increased, while travelling on the good and level portion of the road, but these alternations in the speed and power cannot be effected without a considerable degree of complexity, weight, and expense in the machinery, and as we are confining ourselves to the consideration of the case where velocity is not required, and might even be an inconvenience, the excess of power will be wasted.

These objections to the use of mechanical power, in certain cases, are pointed out, not as being insurmountable obstacles to the use of machinery, but as serious difficulties which, in practice, have not yet been overcome. In fact, there is not at present any practical substitute for horse power on common roads, and as far as the public is concerned nothing has yet been done. We, therefore, must consider them as objections remaining to be overcome; and we are compelled to draw the conclusion, that, at the present moment, animal power (always confining ourselves to the question of the economical transport of heavy goods upon common roads) is superior to any mechanical agent, and that beasts of draught, and particularly the horse, are not only the most ancient, but still remain the most advantageous source of power.

Long experience has pointed out various modes of applying animal power; but it is frequently ill directed, owing to the want of an adequate knowledge of the mechanical structure of the animal, and the manner in which he exerts his strength.

In the most powerful steam-engine, if too great a resistance be applied, or, practically speaking, if we attempt to make it do more work than it is calculated for, there is an immediate loss of power, in consequence of the diminution of velocity caused thereby; and if we continue to oppose a still greater resistance, we reach the point at which it is unable to overcome it, and it ceases to produce any effect. Again, a very small obstacle may be so applied as greatly to impede an engine of considerable power, or even to stop it altogether. The power of an engine is limited, and resistance must always be proportioned to it; and there is a proportion beyond which it is useless to go, and less than which would not absorb the whole force.

An animal is but a beautiful piece of machinery, and although perfect in its construction, and wonderfully accommodating in its movements, it still, like the engine, has a limited power, and has its peculiar modes of action, its strong and its feeble parts; and we must well consider its structure, to be able to apply the resistance in that degree, and in that manner which shall enable it to produce the greatest effect. The consideration of the comparative effects of the exertions of a man and a horse will at once exemplify this, and lead us more clearly to the knowledge of the peculiar qualities or faculties of the horse.

If a horse be made to carry a heavy weight rapidly up a steep ascent, or if a man be employed to drag slowly a heavy carriage along a rough road, the strength of both will be soon exhausted, and little effect produced; but if a man be made to carry a weight up a ladder, and if a horse draw a heavy carriage along a road, they will each produce a considerable effect: yet, in the former case, the horse and the man are as strong as in the latter, but their power is not properly applied, and is consequently wasted.

These different results are easily explained, by considering the mechanical structure of the two bodies, and the mode in which their muscular strength is exerted.

The action of pulling is effected in either case by throwing the body forward beyond the feet, which form the fulcrum, and allowing the weight of the body, in its tendency to descend, to act against the resistance applied horizontally, and drag it forward; as the resistance yields, the feet are carried forward, and the action renewed, or rather continued.

Let A (*fig.* 1.) be the centre of gravity, or the point in which the whole of

Fig. 1.

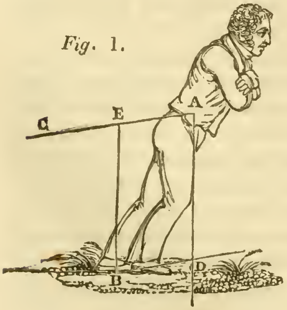
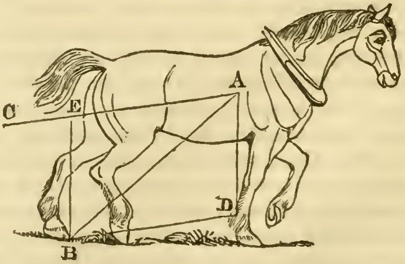


Fig. 2.



the weight of the body may be supposed to be accumulated, and B the fulcrum, or point of resistance; AC the direction of the power to be overcome.

If the legs are inflexible, the body, acting by its gravity, tends in its descent to describe a circle around the point B, but is opposed by the resistance AC; and it is proved by the law of the resolution of forces, that if BD be drawn parallel to AC, the lengths of the lines AD, AB, and DB represent respectively the proportions between the weight of the body, the strain upon the point of support, and the effect produced; that is, if AD be taken as the measure of the weight of the body, then AB is the measure of the strain upon the legs, and BD or AE the power pulling in the direction of AC.

Consequently, the effect increases with the weight of the body and the distance which it is thrown beyond the feet, and is limited only by the capability of resistance at B, or the muscular strength of the legs. This is evidently the case in practice; for even if the body were brought nearly horizontal, when its weight would act to the greatest advantage, still, if the legs are incapable of resisting the strain, they would yield, and no effect be produced. In a man, this muscular strength of the limbs is very great, and he can lift or carry immense weights, and ascend easily, even loaded, a ladder; but he is not well adapted to the purpose of dragging: as his own weight is small proportionably to his strength; and the centre of gravity is low, and by the construction of his body, cannot be thrown far beyond the fulcrum at his feet; consequently, however capable his legs may be of resisting a great strain, AE remains small, and his muscular force is not advantageously brought into action.

A horse, on the contrary, by the formation of the body, can relieve his weight partly from his fore-legs; and, extending his hind legs as in *fig.* 2, throw the centre of gravity a considerable distance in front of his feet B. AE is here proportionably much greater than in the former case, and the whole of his force is, therefore, advantageously employed. He is in fact, by his mechanical construction, a beast of draught.

The same train of reasoning which has here pointed out the species of work peculiarly adapted to the different structure of the man and horse, if continued further, will now serve to show the circumstances under which the power of the latter is best applied, and the greatest effect produced.

We shall here consider both the quality of the draught and the degree.

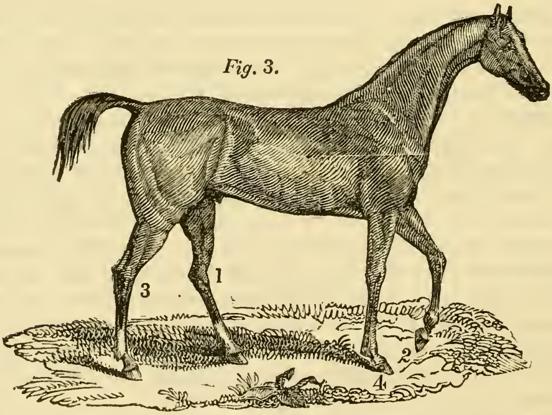
And first, it is to be observed, that although the weight of the animal's body is the immediate cause in the action of pulling, yet, as before stated, it is by the action of the muscles in advancing the legs and raising the body, that this cause is constantly renewed, and the effort continued. The manner, and the order of succession in which a horse thus lifts and advances his legs may, of course, influence the movement of his body, and ought therefore to be examined into: accordingly we find that many writers upon draught have touched upon this part of the subject, but they appear to have contented themselves with inventing in their closet the manner in which they conceived a horse must have moved his legs, rather than to have taken the trouble to go out of doors to see what really did take place, and, consequently, many have arrived at erroneous conclusions. The ancient sculptors, who generally studied nature so faithfully, either neglected this point, or otherwise our modern horses, by constant artificial training, have altered their step: for we find in the celebrated frieze, from the Parthenon at Athens, a portion of which, now in England, is more commonly known under the name of the Elgin marbles, the only horses which are represented trotting, have both their legs on the same side of the body raised at once, the other two being firm upon the ground—a position which horses of the present day never assume while trotting.

In the case of these relievos, it is true that there are only four horses, out of more than two hundred, which are in the action of trotting, all the others being represented in a canter or gallop; and only two of these four are entirely in the foreground, and distinct from the other figures. It would not be safe, therefore, to draw too general a conclusion from this example alone; but we have another decided proof of the remark we have made, in the case of the four horses of the church of St. Marc at Venice.

Whether this was then the mode of trotting or not, it is certain that it is never seen to occur in nature in the present day; and indeed it appears quite inconsistent with the necessary balancing of the body, and was, therefore, more probably an error of the artist.

It perhaps may have been found difficult or troublesome to watch the movement of a horse's legs; but a very little practice will enable any body to verify what we are about to state: by keeping near the side of a horse that is walking, it will be easily seen that, immediately after the raising of either of the hind legs from the ground, the fore leg of the corresponding side is also raised, so that the latter leaves the ground just before the former touches it. If the fore legs be then watched, it will be seen that, immediately after the movement of either of these, the hind leg upon the opposite side is put in action, so that the order of succession appears to be in walking, as numbered in *fig.* 3.

Fig. 3.



If the horse be now examined from a short distance, it will be seen that, when he is walking freely, the successive movements of the legs are at equal intervals of time, and that the muscular force of one limb only is brought into action at the same moment. But if a horse, which is dragging a load with some considerable exertion, be watched, it will be seen that he then acts longer upon his legs, and allows a less interval of time for raising and advancing them; and at the same time, the regularity of the movement is generally destroyed; the limbs on the same side generally being moved more simultaneously, or at nearer intervals of time than those at the opposite corners: thus, the muscular forces of two limbs are always acting together, the movement of the whole body is less continued and uniform than in the former case; but each impulse is more powerful, and a resistance, which would be too great for the muscles of one leg, is overcome by the united exertion of two. We shall point out, hereafter, the necessity of attending to this in the application of this power to draught.

In trotting, the action is of course quicker, and a less resistance will, as might be expected, cause the horse to move his legs at two intervals instead of at four equal intervals of time: indeed, a horse accustomed to go in harness generally acquires the habit of that action. There is this striking difference between trotting and walking: in walking, we have seen that the interval between the movement of the legs on the same side was less than the other interval of time: in trotting, on the contrary, the legs situated diagonally, or at opposite corners, move almost simultaneously. Owing to the velocity and the momentum which the body acquires in consequence of that velocity, in trotting fast, the successive impulses are less distinctly perceptible, and the movement more continued and uniform than in a slow trot, or in walking.

In galloping, the movement is totally different: the fore legs are thrown forward nearly simultaneously, and the hind legs brought up quickly, and nearly together; it is, in fact, a succession of leaps, by far the greatest interval of time elapsing while the legs are extended after the leap is taken: this is the position, therefore, which catches the eye, and which must be represented in a drawing to produce the effect of a horse in a gallop, although it is the moment when the animal is making no exertion.

The canter is to the gallop very much what the walk is to the trot, though probably a more artificial pace. The exertion is much less, the spring less distant, and the feet come to the ground in more regular succession: it is a pace of ease, quite inconsistent with any exertion of draught.

The consequence of these peculiar movements in the limbs of the animal is, that a succession of impulses is conveyed to the body; and when the movement is slow, and the body of the horse does not acquire any considerable impetus or momentum, the resistance should be *such as to receive each of these impulses, and leave the horse unrestrained in the intervals.*

It must, therefore, be a rigid resistance, void of elasticity.

It must not, however, be a constant, unremitted resistance.

For it is a well-known fact, that, however powerful may be the muscles of a limb, they must not be kept constantly on the stretch. Thus we feel even more fatigue by standing than by walking, because one particular set of muscles is then kept constantly exerted. It is evident, therefore, that the resistance or draught must not be perfectly constant but should afford frequent opportunities of relaxing the efforts. Neither must it be a yielding resistance, as in that case the animal could not make any great exertion ; for if he applied too much power, he would be liable to fall forward, and should he at any time fall short of the necessary exertion, he would be drawn back by the strain, and it would require a considerable effort to restore the motion.

If a horse be made to drag a rope passing over a pulley and descending into a well with a certain weight, say of 200 lbs. attached to it, it is obvious that he could not make an effort greater than 200 lbs. without instantly considerably increasing his velocity, which would be a waste of power; nor must he for an instant relax his efforts, or fall below that mark, for he would then be unable even to resist the pull, and would be overcome by the weight. Such an extreme case as this, of course, is not likely to occur often in practice, but the disadvantage of the principle is obvious.

An arrangement of this sort is, indeed, sometimes made use of, for raising the earth from excavations, or the materials of a building; but the exertion is continued only for a few seconds, or for a distance of not more than ten or twenty yards: if prolonged, the inconvenience would be seriously felt, as it is, to a certain degree, in towing canal boats; the length and curve of the rope give an elasticity to the strain, and the necessity of keeping the rope out of the water, or from dragging along the towing-path, compels the animal to keep up a constant, unremitted pull, and that, too, in an oblique direction, so as to throw him into an unfavourable position. We accordingly find that, under these circumstances, the average work of a horse is equivalent only to about four-fifths of that given by Smeaton, Desaguilliers, and others, who estimated the power of the horse from the work done in a horse-mill, where the resistance is inelastic, and all circumstances favourable, with the exception of the circular path.

The disadvantage of this kind of resistance is well known to carmen, though of course without consideration of the reason. A horse is said to pull better when he is close to his work, that is to say, when he is attached at once to the body to be moved, because every exertion he makes is then communicated at once to the mass; but the leader of a team, unless he keeps the traces constantly on the stretch, may frequently waste a powerful effort without producing much effect upon the carriage.

Another inconvenience resulting from harnessing horses in a team, or one before the other, is, that the leader, by tightening the traces, is continually relieving the strain from the body horse, and reciprocally the body horse from the leader; so that these horses labour under all the disadvantages of a long, elastic, and constantly yielding connexion with the load, which is not only fatiguing to them, but, in cases where the resistance is variable, prevents the full and united effect of their exertions being properly communicated to the carriage. For, if a slight obstacle, as a rut or stone in a road, checks the progress of the vehicle, the shaft-horse can immediately throw his whole weight into the collar, and the united effect of his strength and impetus is conveyed unimpaired to the vehicle, and forces it over the obstacle; but if any elasticity is interposed between the power and the resistance, as in the case of the traces of the leader of a team, the whole, or the greater part of the effect of impetus is lost, and that force, which, if concentrated in one effort, would effect the object, being lengthened into a continued and comparatively feeble pull, is insufficient.

If we wish to destroy the impetus of a body moving with violence, we receive it with a yielding resistance; the action of catching a cricket-ball exemplifies this perfectly; and therefore, if the full effect of momentum is wanted, all elasticity in the direction of the movement should be avoided.

We have entered rather fully into the consideration of this particular point, because the principle is not only applicable to the mode of communicating the immediate action of the moving power, but will be found also of considerable importance when we arrive at the subject of wheel-carriages.

A consideration of these various points brings us to this conclusion, that the draught ought neither to be constantly uniform or without remission, nor yet yielding or elastic: sudden shocks or violent changes in the velocity must also evidently be disadvantageous, as tending to distress and injure the animal.

Having determined upon the necessary quality of the resistance, we will proceed to examine into the quantity or the degree of resistance or draught, and the speed best adapted to the exertion of the animal. The useful effect of a horse, or the work done, must evidently depend upon three things, *viz.* the rate at which he is made to travel, *the power of traction he can exert,* and *the number of hours he can continue to work daily at that speed;* and where there is no fixed condition which determines any one of these, such as a particular load to be moved, or a certain velocity which it is desirable to attain, or a limited time to perform the work in, then the object must be to search for those proportions of the three by which, at the end of the day, the greatest quantity of work shall have been produced.

With respect to the first two, *viz.*, the speed and power exerted, it will be obvious, that where a horse travels unloaded, the greatest distance he can go in any given time for several days in succession without injurious fatigue, is *the limit of his velocity:* on the other hand, the load may be so great, that he can scarcely put it in motion—this is the limit of his power: in both cases, the useful effect is nothing. But between these limits of velocity and power, there is a proportion which affords the maximum quantity of effect, and which, therefore, must be the most advantageous for the application of horse-power.

It has been asserted by theorists, and the theory appears to be supported by experience, that the velocity corresponding to this maximum, or that at which a horse working continually a certain number of hours per day will do the most work, is equal to half the extreme or limit of velocity of the same horse working the same number of hours unloaded; and that the force of traction corresponding to this speed, is equal to half the limit of his power. For instance, if six hours be the length of a day's work decided upon, and if a horse working that time can go six miles per hour unloaded, and therefore producing no useful effect, and supposing the limit of power of the same horse be equal to 250 lbs., it is found that he will do the most work in the same number of hours when drawing a load at the rate of half six, or three miles per hour; and half of 250 or 125 lbs. will be the strain corresponding to this speed. Our next step, then, must be to *find* these *limits:* now, the limit of velocity depends upon the length of time during which the speed is kept up; we subjoin therefore a table deduced from experiments, and which represents the proportion of the duration of labour and maximum velocity of the average of horses accustomed to their respective velocities.

Duration of labour	Hours. 1	2	3	4	5	6	7	8	10
Maximum velocity unloaded in miles per hour	14¾	10½	8½	7⅓	6⅔	6	5½	5¼	4⅔

This within the range here given may be considered as very nearly the law of decrease of speed by increased duration of labour; and at the first glance we see the great advantage of reducing the speed and prolonging the exertion. There are, however, many causes to limit the duration of a day's work of a horse. Tredgold, in his work on Railways, before quoted, says: 'The time assigned for the day's work of a horse is usually eight hours; but it is certain, from experience, that some advantage is gained by shortening the hours of labour; and we have observed, that a horse is least injured by his labour, where his day's work is performed in about six hours; where the same quantity of labour is performed in less than six hours, the over-exertion in time shows itself in stiffened joints, while the wearying effects of long-continued action become apparent, if the duration of the day's work be prolonged much beyond eight hours. Indeed, under the management of a good driver, a full day's work may be completed in the time before mentioned—six hours—with benefit to the health and vigour of the animal.'

We may be permitted, however, to abandon the idea of improving the health of the animal, or of rendering his business a pleasure to him—an attempt, the success of which is, we should think, very questionable, and content ourselves with endeavouring to check the barbarous practice of working horses to death either by overdriving or overloading them; and we shall, as is generally the case, consult our own interests and follow the dictates of humanity at the same time, by not injuring so useful an animal: and we think experience proves there will be no danger of doing this by working eight or nine hours a day. By referring to the Table above, we see that the maximum velocity of the average of horses corresponding to eight hours' work is five miles and a half per hour, consequently, the rate at which he would travel when loaded is a little more than two miles and a half per hour. There is no doubt that some horses could conveniently travel faster; but as the speed must generally be governed by that of other horses, the average is, in this case, the rate to be adopted. The force exerted under these circumstances depending upon the quality of the horse, it is very difficult to obtain even an approximate value of it, unless the experiment be made upon each individual horse: it is fortunately, however, of no great consequence in practice, because if we feel sure that we are employing all the *power* we can command to the greatest advantage, it is not of any very great importance that we should know the *exact amount* of that power.

In comparing animal horse-power with that of the steam-engine, we estimated it at about 125 lbs., but we believe that, with tolerably good horses, it may generally be taken at more than that.

We have thus far confined our attention to the cases where velocity, as well as duration of labour, was left to choice; this is far from being always the case. In stage-coaches, or other conveyance for passengers, speed is absolutely necessary, and it only remains to learn how that speed can be obtained with the greatest economy. The following Table, extracted from Tredgold, will show the great reduction in the effect produced by increasing the velocity.

The first column being the velocity or rate per hour, continued for six hours per day; the second represents the force of traction of which the animal is capable; and the third, the comparative effects produced. A force of traction of 125 lbs. continued for six hours at the rate of three miles per hour being taken as the standard, and considered equal to the arbitrary number 1000.

Miles per hour.	Force of traction in lbs.	Effect produced.
2	166	888
3	125	1000
3½	104	972
4	83	888
4½	62½	750
5	41⅔	555
5⅛	36½	500

If, however, the hours of labour be lessened, taking the velocity corresponding to the greatest useful effect, the results will be much greater, and the velocity may be raised much higher, as will be seen in the following Table.

Here the first column is the length of days' work, the second the best velocity corresponding to that time, or half the limit of velocity shown in Table (1), and the third column the comparative effect produced, the force of traction being in each case 125 lbs.

Duration of labour in hours.	Velocity, miles per hour.	Effect produced.
2	$5\frac{1}{4}$	578
3	$4\frac{1}{4}$	709
4	$3\frac{3}{8}$	813
5	$3\frac{1}{4}$	909
6	3	1000
7	$2\frac{3}{4}$	1063
8	$2\frac{5}{8}$	1110

To attain higher velocity, it is necessary still further to reduce the load, and the next Table is calculated upon the supposition of the strain being only one half the last, *viz.*, 62½ lbs; this is about the average exertion of each horse in a four-horse heavy stage-coach.

Duration of labour, hours per day.	Velocity.	Effect produced.
4	$5\frac{1}{2}$	613
3	$6\frac{2}{5}$	534
2	$7\frac{4}{5}$	434
1	11	307

In mails or light coaches, where ten, eleven, and even eleven and a half or twelve miles an hour is attained, the average strain of each horse is barely 40 lbs., and the effect produced, or value of work done, not much more than one-half the above.

It must be remembered, that these tables are all calculated upon the supposition of the road being good, and the work such as not to cause any immediate injury to the animal, and is adapted only to the average quality of horses. They are not therefore at once applicable as data for calculations in all ordinary cases, but only serve to shew the comparative forces which may be exerted under different degrees of speed. The results or effects of this force will always be influenced by the quality of the resistance as we have already observed in the cases of slow travelling, but in rapid travelling the power is much more expensive, owing to the great loss which we see by the tables is sustained by increased velocity; and it is, therefore, the more important to study well the means of applying the power in question.

In this rapid travelling, the bad consequences of a uniform and constant strain is still more felt by the horses, and the necessity of occasional relief is still more urgent than at low velocities. It is universally admitted by horse proprietors and postmasters, whose interests make them peculiarly sensible on this point, that a flat piece of road is more destructive of horses than the same length of road where gentle rises and alternate flat and swelling ground occur; and that a long hill is easier surmounted where there are occasional short levels, and even descents, than when the whole is one uniform ascent.

It only remains for us, before we dismiss the subject of the moving power, to consider the particular mode of applying it, or the manner of harnessing the horses.

Under this head comes the question of the best direction of the traces, or, as it has generally, but less clearly been called, the angle of inclination of the line of traction. This question appears to have been always considered one of great importance: the point has been frequently discussed, and various opinions have been advanced; some having recommended it to be horizontal, others inclined; and, as they have each in their turn, in demonstrating the correctness of their own theory, proved the error of others, there can be no presumption in laying them all aside, and in taking a different, but at the same time, a more simple and practical view of the case. By referring to a figure similar to that by which we showed the mode of action of the horse in pulling, we see that if AD represent that portion of his whole weight which is relieved from his fore-legs, and AE the direction of the traces, then AF is the measure of the horizontal pull upon the carriage. Now, AF bears a constant proportion to AB, which represents the strain upon the legs; and AD being constant, AB, and, consequently, AF, increase or diminish according as the angle ADB is increased or diminished: that is to say, the horizontal pull applied to the carriage is proportionate to the strain upon the legs; but they are both dependent upon the angle formed by the traces, increasing or diminishing as the latter are inclined downwards or upwards from the collar; so that whether the traces be inclined upwards, as *fig.* 4, or downwards, as *fig.* 6, or whether they be horizontal, as *fig.* 5, makes no difference in the manner of pulling. In the first case, a portion of the animal's weight is borne by the traces, and is transferred by them to the carriage. AF is here small, but the strain upon the legs AB, is also proportionably less than in the second case, where the traces are horizontal. In *fig.* 6, where the traces incline downwards, we see that the horizontal force AE is much more considerable; but, at the same time, AB is increased, and consequently the muscular exertion required in the legs is proportionably great: in fact, here a portion of the weight of the load is transferred to his shoulders.

Fig. 4.

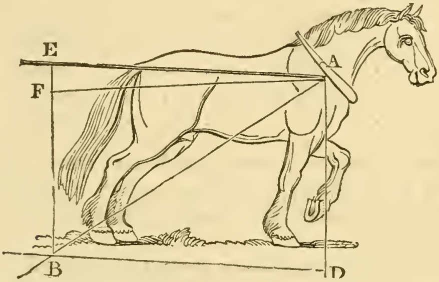


Fig. 5.

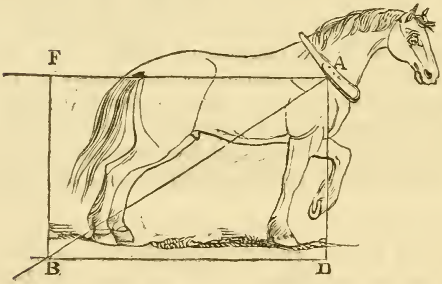
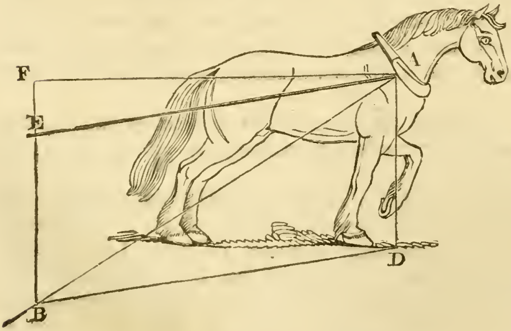


Fig. 6.



The comparative advantages, therefore, of the three, do not follow any general rule, but depend simply upon the peculiar qualities of the particular animal employed, and his relative capabilities of lifting and pulling, or the proportion existing between the weight of his body and his muscular strength. To render this more clear to our own feelings, we will put the case of a man. We have already seen that an able-bodied man is more adapted for lifting than pulling; consequently, in his case it would be advantageous to throw a certain portion of the weight upon him, by making him pull upwards, as in *fig.* 7, or what we are more accustomed to see, and which amounts to the same thing, applying his strength to a wheelbarrow, *fig.* 8, and we have frequently seen an ordinary man wheel 800 lbs. in this manner.

Fig. 7.

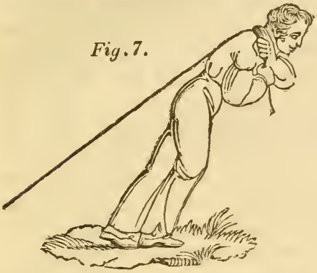
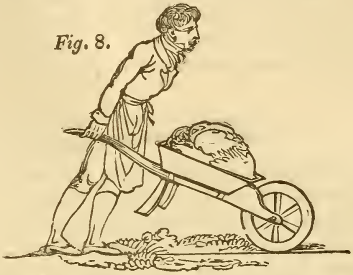


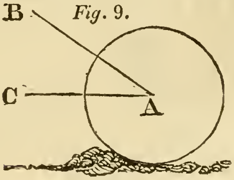
Fig. 8.



If, however, we take a person accustomed to hard work, and consequently not so strong in the legs, although he may be unable even to lift the wheelbarrow which the other moved with ease, still he may, by pushing horizontally, put in motion a considerable load; and lastly, in the case of an invalid who can barely carry his own weight, if he lean on the back of a garden chair, he will not only walk himself, but push on the chair; or a child who is yet too weak to stand, can, if part of his weight be supported in a go-cart, not only move himself, but also the frame which supports him. These are very familiar and homely comparisons, but they are cases exactly similar to the three positions of the traces; and the argument will equally apply to horses as to men. It is true, we rarely use for draught a horse that cannot stand; but the case is very possible that a large heavy horse, otherwise not strong, or one which it was not desirable to fatigue, might pull better and longer, if part of the weight was borne upon the carriage, or if, in other words, the traces pulled upwards. And we know by experience, that in the case of stage-coaches, where, owing to the speed, the weight of the horse's body is already generally a burden to him, it is disadvantageous to increase that weight by inclining the traces much downwards; on the contrary, where we wish to obtain the utmost effect of a powerful horse, or of a horse that is muscular, but without much weight forward, it is highly advantageous to augment the effect of his gravity by inclining the traces even as much as 15°, or about 1 upon 3; the strain upon the traces will be then considerably increased, and the effect augmented, provided always that he is able to exert the necessary strength in his legs. As far, therefore, as the mere force of traction is concerned, there is no particular angle which will always produce the greatest effect—but it must depend upon the particular capability of the horse; and this in its turn varies, and is affected by circumstances; for the same horse that upon a level road requires no addition to his weight, might be materially assisted by a slight addition when ascending a hill, if not continued too long; and most horses would be benefited considerably by the opposite arrangement in a descent, that is, by a portion of their weight being borne up; they should at least have no additional load thrown on them while descending a hill.

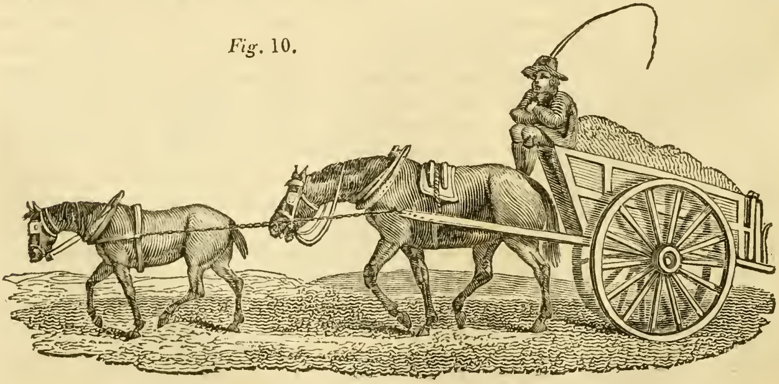
There is also a time, when inclining the traces downwards is almost indispensable: it is when dragging a four-wheeled waggon over a rough broken road. If the front wheel, which is generally small, meets with an obstacle by falling into a hole, or stopping against a stone, it requires no profound reasoning to show, that a force pulling upwards in the direction AB, *fig.* 9, will raise the whole wheel over the obstacle with much greater facility than if applied horizontally, as AC: this is the only circumstance, unconnected with the horse, that ought to govern the direction of the traces, and the degree of the inclination here must, of course, still be proportioned to the power of the horse. We see therefore that, in proportion as the horse is stronger, or that we are disposed to make him exert a greater effort, the traces should be inclined downwards from the collar: with a good average horse, perhaps one-sixth or one-seventh of the distance from the collar to the extremity; with a horse of inferior capabilities, arising from weakness in the limbs, and not want of weight, or with an ordinary horse when travelling above six miles an hour, the traces should be nearer the horizontal line, except when the circumstance of a rough road, before alluded to, requires some modification of this. To be able to apply these rules generally in practice, it would be necessary to have some means of altering the traces while on the road; as we have stated that they should be differently arranged according as the road is level or rough, or ascending or descending, this would not be difficult to contrive, and has, indeed, been suggested by some writers upon this subject; but it is probable that, except in stage-waggons, where the same carriage goes along a great extent, and consequent variety of road, it will be sufficient to adjust the traces according to the average state of the roads in the neighbourhood; and we cannot greatly err, if we bear in mind that, inclining the traces downwards from the collar to the carriages, amounts to the same thing as throwing part of the weight of the load on to the shafts, a thing frequently done in two-wheeled carts, and a manœuvre which all good carmen know how to put in practice. The impossibility of inclining the traces of the leaders, owing to their distance from the carriage, is an additional reason to those given before, why they (the leaders) cannot, when required, exert such an effort as the shaft-horse or wheeler; and on rough cross-roads, is a great argument in favour of harnessing horses abreast.

Fig. 9.



Yet what can be more contrary to the rules here laid down than the

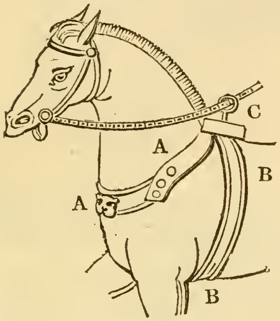
Fig. 10.



injudicious mode frequently adopted in harnessing horses? How constantly do we see the efforts of horses paralysed by misapplication of their respective qualities! In the annexed sketch, (*fig.* 10,) for instance, which represents a very common specimen of this, the light, muscular, little horse, which is capable of considerable exertion, is nearly lifted from the ground, and prevented from making any exertion, by the traces leading upwards; while the feeble old horse, scarcely capable of carrying his own body, is nearly dragged to the ground, and compelled to employ his whole strength in carrying himself, and even part of the weight of the leader; so that the strength of the one willing to work is not employed, and the other is so overloaded as to be useless.

The mode of attaching the traces does not admit of much variety. The shoulders have always been made use of for this purpose.

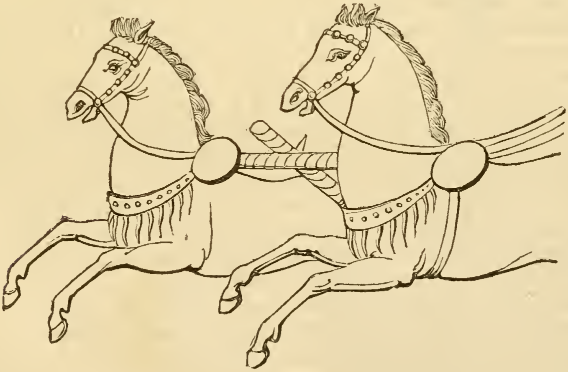
Fig. 11.



Homer, who is supposed to have lived about 900 years B.C., describes very minutely, in the twenty-fourth book of the Iliad, the mode of harnessing horses at the time of the siege of Troy, nearly 3000 years ago; but if we suppose that his description was taken from the harness in use in his own time, it is still referring to a period about twenty-seven centuries back.

A simple strap, formed of several thicknesses of leather, so as to be very stiff, and fitted well to the neck and shoulders, served as a collar, as seen at A A, (*figs.* 11, 12.) A second strap, B B, passed round the body, and was attached to the shoulder-strap at the withers. At this point was fixed the yoke, C C, which was fixed to the pole.

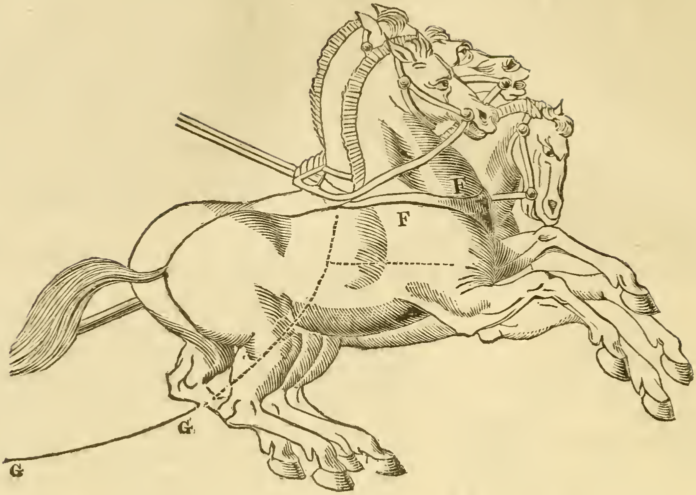
Fig. 12.



A pair of horses were thus yoked together, without traces or breechings, as oxen are seen at the present time in many parts of the country.

This was a simple arrangement, but by no means a bad one; and it would appear that they performed all the manœuvres of cavalry with chariots and horses thus harnessed. The pair yoked to the pole were called yoked horses; abreast of these was frequently placed what was called an outer horse, with a simple shoulder-strap or collar FF, and a single trace, G G, passing inside, as in *fig.* 13. Sometimes there were two of these horses, one on each side, each furnished with his strap or collar and trace.

Fig. 13.



These straps, if well fitted, were not bad; but as they must have pressed in some degree upon the throat, they could not be equal to the collar of the yoked horses, still less to the collar at present used.

In more modern times these shoulder-straps gave place to the breast-strap. A horse can no doubt exert a considerable strain against such a strap, but in action it must impede the movement of the shoulder.

In some parts of South America the trace is fixed to the pummel of the saddle, which in its turn is well secured to the horse by saddle-girths, breast-straps, and breechings; and we are informed that horses in this manner drag very considerable loads. It resembles completely the harness of the ancients, with the addition of the breechings. It is, of course, a mere temporary arrangement, convenient only as requiring no preparation. The trace is, in fact, the lasso of the rider, which is always fastened to the saddle; and when he has entangled it round the horns of a bull, or attached it to anything he may have occasion to transport, he takes one or two turns of the thong round the pummel of the saddle, and the horse will at full gallop drag the load after him. Here the load being generally upon the ground, the trace must incline considerably downwards; and this, added to the weight of the rider, will perhaps account in some degree for the extraordinary effects of a young powerful horse goaded to the utmost, and continuing the exertion only for a short time.

A gentleman who travelled some time in this part of America, and frequently witnessed the practical effects of this arrangement, has suggested the propriety of introducing it into the artillery, by means of which a number of horses might in an instant be attached to a gun, to extricate it from any heavy or broken ground in which it might be entangled. Certainly, the length of these traces would enable these additional horses to secure a good footing; and any number of horses might thus be made to lend their assistance in time of need. We do not pretend, however, to judge of the practical utility of this measure, but merely record the suggestion of another.

The collar now generally used is an improvement upon the ancient shoulder-strap described by Homer; and it is probably the best possible mode of attaching the traces to the horses. If the connexion is made at the proper place on the collar, the latter bears flat and evenly upon the muscles which cover the collar-bone, and the shoulders of the horse are left almost as free in their action as if the collar were not there. About A, (*figs.* 14, 15,) is the point of the shoulder where the trace should come; and a little inclination downwards, which can easily be effected in the case of the shaft-horse by the shafts, and in the others by the belly-band, will, if necessary, prevent the collar rising up, and inconveniencing the throat of the horse.

Fig. 14.

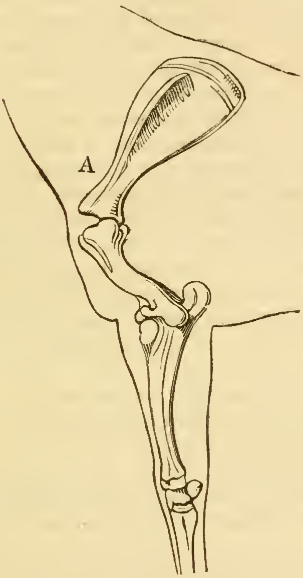
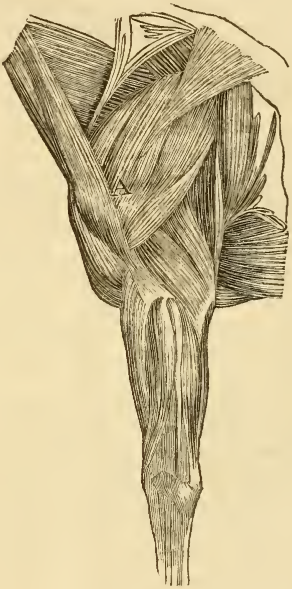


Fig. 15.



Reflecting upon the various circumstances which we have shown to occur in the application of animal power, and the various conclusions we have drawn while considering the best and most advantageous application of this power—and we must be excused the frequent repetition of the terms, for the sake of the clearness gained by it—it would appear that the resistance should be as much as possible rigid and inelastic, so as to receive immediately and unimpaired the direct effects of the slightly irregular exertions of the animal; that this resistance should not be such as to yield directly to a sudden impulse; that it should be so far uniform as to be free from violent changes or sudden shocks, but not so constant as to allow of nor remission, nor of those alternations of exertion and comparative relaxation which we have stated to be advantageous to the perfect development of animal power.

That, as regards the degree of resistance, where velocity is not required, a force of traction of from 100lbs. to 125lbs., or even 150lbs.*, according to the strength of the horse, continued for eight hours a day, at about two and a half to three miles per hour, is the best proportion of quantity and duration of labour; that where six or eight miles per hour is required, the duration of the day's work should be shortened to five or six hours, and the draught reduced to 80lbs. or 100lbs. At still higher velocities the draught must not exceed 50lbs. or 60lbs., and the time of working two or three hours. But this speed can only be attained by the sacrifice of the horse; and consequently the question will rather be what the horse is capable of doing than what can be done with economy; and it becomes a matter of calculation depending altogether upon the first cost of the horse, and the profits arising from his employment.

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* The load which will produce this amount of draught will be determined when we consider the subject of the roads, on the quality of which it will be seen that this mainly depends.

With respect to the mode of harnessing the horse, it is hardly necessary to say that great care should be taken in fitting the collar and in attaching the traces to the proper point. As to the direction of the traces, it must, as we have shewn, entirely depend upon the circumstances of the case. Where the draught is heavy and slow, if the road be good, the traces should be nearly horizontal, unless the journey be short, or the traffic be only in one direction, and the cart return empty, or unless any other reason render it desirable to compel the horse to exert himself more than he would naturally do; the traces should then be inclined downward towards the carriage, with an inclination perhaps of one upon four or five, provided always that the horse is capable of continuing the exertion which, by the additional load thrown upon his shoulders, he is thus called upon to make. If, in the same case of low speed, the road be very heavy, or broken and rough, the proportion of draught upon each horse must be lessened, but the traces should be attached still lower to the carriage, at a slope of one upon three or four, by which much greater power is given to the animal to drag the load over any obstruction.

At all high velocities, the traces should generally be horizontal. The cases of rough roads or powerful horses may slightly affect this arrangement, as at low velocities, but not in so great a degree.

We will now proceed to examine the mode in which these conditions are practically to be fulfilled, and the result of the application of the principles which we have laid down, by considering the subject of *the vehicles for conveying the weight to be moved.*

Those in present use are boats, as canal boats, sledges, and wheeled carriages, which last of course include every species of carriage, whether waggon or cart, heavy or light.

Canal boats and canals we suspect are going fast out of use, and will very shortly give place entirely to railways; but still it must be many years before this can be effected; and in the mean time, the produce of the most extensive manufactures in the world, and the supply of immense masses of people, will be transported over these beautifully smooth, level, noiseless roads; and, even if their beds were dry, and become the course of railways (an event which may perhaps befall some of them), we must, out of respect for the extraordinary benefits we have derived from their assistance, and the almost incredible effect they have produced upon the commerce and riches of the country, have devoted a few lines to that part of their consideration which bears upon our subject, *viz.*, the draught of canal boats.

The great advantage in the transport of goods by water conveyance, is the smallness of the power required. A body floating in water is left so very free in its movements, that motion may be gradually communicated to it by any power however small, at least the limit is very far removed; but although a very slow movement may thus easily be obtained, the slightest increase of speed causes a very great increase of resistance.

The resistance to a body moving in a fluid, arises principally from the striking of the particles of the fluid against the front of the moving body, so that if the speed of the vessel be increased, not only does it encounter a proportionably greater number of particles, but also it is struck by each with a force proportionate to the velocity, and consequently the resistance is found to increase as the square of the velocity; thus, if the speed of the vessel be trebled, the number of particles, or the quantity of water which it meets in its progress for a certain space of time, is trebled, and the resistance of each particle being also three times as great, owing to the boats striking it with treble the velocity, the united effect is nine times as great; therefore, if in the first instance it required one pound to draw the vessel, it would now require nine, but nine times the weight or resistance, moved at three times the velocity, will require twenty-seven times the *quantity* of power in action; consequently, we see that the resistance increases as the square of the velocity, and the power required to be exerted for a given time increases as the cube of that velocity.

There are some other causes of resistance, which do not vary in this proportion, but at moderate velocities; and in all ordinary cases this may be considered as a tolerable approximation to the real law of the increase, and shows at once the impossibility of using water conveyance where speed is required. The draught of an ordinary canal boat, at the velocity of $2\frac{1}{2}$ miles per hour, is about $\frac{1}{900}$ of its weight, that is to say, a canal boat, with its load weighing 33 tons, or 73,920 lbs., is moved at the rate mentioned, by a force equivalent to 80lbs., being $\frac{1}{926}$ part of the load. This is found by Mr. Bevan to be the result upon the Grand Junction Canal, and a force of traction of 80lbs., is here found to be equivalent to a horse power. The average power of an ordinary horse is certainly rather more; and in the commencement of this paper, we mentioned this as an instance of a small effect being produced, most probably owing to the peculiar application of the power. We believe it to be the case, and think it likely, that if the disadvantages before alluded to, arising from the mode of applying the power, could be removed, the effect might be raised to 100 lbs. or 120 lbs. of traction, and consequently the load moved would then be 40 or 50 tons; this is an increase well worthy of consideration.

We now come to the consideration of the means of transport employed on land. These are sledges, rollers, and wheel carriages. The order in which they are here mentioned, is probably that in which they were invented or first employed. A sledge is certainly the rudest and most primitive form of vehicle; the wheeled carriage, and even the placing the load itself upon rollers, is the effect of a much more advanced state of the mechanical arts, and is probably of much later date than the sledge.

When man first felt the necessity or the desire of transporting any article from one spot to another, he doubtless endeavoured to lift or carry it: if it proved too heavy for him to carry, he would naturally endeavour to drag it. Here, frequent experiments would soon show him how much less labour was required to drag a body with a smooth surface in contact with the ground, than when the contrary was the case; and if the body to be moved did not itself present a smooth surface on any of its sides, but was, on the contrary, rough and angular in all directions, he would naturally be led to interpose between it and the ground some plane surface which should prevent the angles and projections of the body from entering the ground and impeding the progress; and we may presume that sledges were thus very early brought into use. When attempting to transport still heavier masses, the accidental pressure of round stones, or a piece of timber, may have shown the advantage of interposing rolling bodies, and thus may rollers have been invented and first brought into use.

These steps appear natural and likely to have led to these results; they are at any rate sufficient to account for the first introduction of these two means of facilitating transport, but no steps of this kind appear capable of leading to the beautiful yet simple contrivance of a wheel.

A roller is by no means an imperfect wheel, as it may at first appear to be; they have nothing in common but their rotatory or revolving action, but the effect of this motion is totally different in the two. In a roller, friction is avoided altogether by it, in a wheel it exists as completely as in a sledge, but the sliding surfaces being at the centre of the wheel, instead of on the ground, are always the same, and being under control, may be kept in that state which shall cause as little friction as possible: moreover, the friction is at a point where we have the means of overcoming it, by acting with the power of a considerable lever, as we shall hereafter show.

There is, indeed, a kind of roller, which partakes somewhat of the character of the wheel, but without possessing the advantages of it.

This species of roller may have been an intermediate step between the two, and we shall therefore describe it, when we have dismissed the subject of sledges and rollers.

In England sledges are at the present time very little in use. In some commercial towns the facility with which bulky and heavy articles can be placed upon them, without being raised to the height of a cart, has caused them still to be employed, but even in these cases, they are in general used only upon the pavement where the friction is not considerable, and for short distances, in which case the saving of labour, in loading and unloading, more than compensates for the increase of power absorbed by the draught. Low-wheeled trucks would, however, in these cases possess the same advantage, and might be substituted for them, if this advantage is so indispensable: for agricultural purposes they are almost become obsolete, and for all purposes of traffic between distant points, they are quite abandoned.

It is only in the North of England and in some parts of Cornwall, that they are sometimes used in farms, but wherever good roads exist, and mechanical arts keep pace with the improvements of the age, they have given place to wheel carriages. An examination into their nature and action will immediately account for this.

A sledge is merely a frame, generally of wood, upon which the load is placed, and resting at once upon the ground, the friction between the under surface of the sledge and the ground bears a considerable proportion to the load; but if the ground be very uneven and full of holes, the sledge, by extending over a great surface, avoids the holes, and slides only upon the eminences, which being naturally the stones or the hard portions of the ground, cause less friction; on such a road, a wheel would be continually sinking into those holes, and thus oppose considerable resistance, and would also expose the load to frequent danger of upsetting.

It would appear, therefore, that over broken ground, or even upon a very bad uneven road, a sledge may be more advantageous than wheels, and its extreme simplicity of construction renders it very economical as regards first cost; but the ground must indeed be very bad, or the country be very poor and little cultivated, where the formation of roads would not amply repay themselves by allowing the use of wheels; for the power required to draw a loaded sledge will be at least four or five times greater than that required for an equally loaded cart upon a tolerably good road.

The draught of a sledge, even upon the pavement, is about one-fifth of the load, so that to draw a ton weight, requires a force of traction of about four hundred weight; upon roads the friction will be much greater: it is difficult to state its amount, as it must depend so much upon the nature of the ground, but with the load before mentioned, *viz.* one ton, the force of traction will probably vary from five to seven hundred weight: over a strong rocky surface the resistance of a sledge will be much the same as on pavement. Its use, therefore, must be confined to very particular cases, where the absence of roads, or the want of means, prevents the adoption of more improved vehicles; and these cases are fortunately too rare in England to render it worth our while to bestow much time upon its description.

Sledges are generally formed of two longitudinal pieces of timber, four or five feet apart, with their lower edges shod with iron; and transverse planks, bolted to these, form the floor, and they are thus easily constructed. The traces should be more inclined than with wheeled carriages, because the friction bearing a greater proportion to the load it is more advantageous to throw a portion of that load upon the horse, and being used upon uneven ground it is more important to be able to lift the front of the sledge over obstacles.

Although in this country the use of sledges is very limited, in many parts of the world they constitute the best, and, indeed, the only means of conveyance. Upon ice the friction is so trifling that they oppose less resistance even than wheels, for the reasons before stated of their covering a larger surface, and thereby sliding over those asperities which would impede the progress of a wheel; upon snow the advantage is still more decided: where a wheel would sink a considerable depth and become almost immoveable, a sledge will glide upon the thin frozen crust without leaving a trace, and with an ease truly wonderful. In all cold climates they are consequently in general use; and the depth of winter is there the season for the transport of merchandise.

The Esquimaux with their dogs, the Laplanders with their rein-deer, and the Russians with horses, use the sledge to a great extent in the winter, over the frozen rivers or the hard snow.

In the warm climates, on the contrary, not only are they now almost unknown, but the records which refer to periods so far removed as 3000 years make no mention of such conveyance.

Rollers come next under consideration; they certainly afford the means of transporting a heavy weight upon land with less power than any other means with which we are acquainted; their motion is not necessarily attended with any friction. A cylinder, or a sphere, can roll upon a plane without any rubbing of the surfaces whatever, and consequently without friction; and, in the same manner, a plane will roll upon this roller without friction: in practice, this is more or less the case, according to the perfection of workmanship in the formation of the rollers, and, if the cylindrical, the care with which they are placed at right angles to direction at which they are to move. There is only one source of resistance which is inseparable from the use of rollers, *viz.*, the unevenness of the surfaces, or the yieldings of the material, which amounts to nearly the same thing.

A circle resting upon a straight line can only touch it in a single point, and the contact of a cylinder with a plane is merely a line: consequently, if the material of the roller, and the surface on which it rolled, were perfectly hard and inelastic, such would be their contact, whatever weight might be placed upon the roller.

Fig. 16.

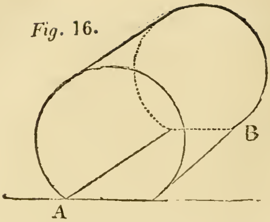
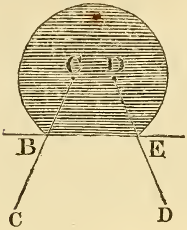


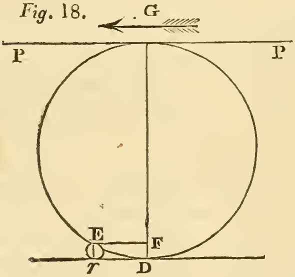
Fig. 17.



But in practice no such material can be obtained, and rollers, on the contrary, are generally made of wood, and when loaded they must yield until the surface A B, *fig.* 16, is proportionate to the pressure. Still, if the substance were perfectly elastic, that is to say, if it would return to its original form with the same force and velocity which were required to distort it, this alteration would not cause any resistance; the elasticity at E would tend to raise the back of the roller with a force D E, *fig.* 17, equal to, and exactly similar, but opposite to C B, and would consequently balance it.

Although perfect elasticity is unattainable, yet most hard substances possess this quality to some extent; consequently, when the load is not sufficient to CRUSH *the materials*, the resistance is not much increased by even a considerable yielding,—provided this yielding, as we before said, arises from elasticity. Thus, if a bladder be filled with air and used as a roller, the resistance will not be greater than if a perfect and hard cylinder were employed, although the bladder may be nearly flattened under the weight;—but the permanent compression of the roller and the crushing of dust or other extraneous substances lying in the way are the great impediments to its movement; these constitute a resistance in the direction B C, which is not counterbalanced by any force arising from elasticity on the opposite side. The effect of this resistance is dependent upon the diameter of the roller, diminishing when the latter is increased, though not in so rapid a proportion.

Fig. 18.

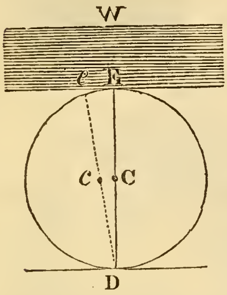


If A B C be a circle, let a horizontal force P be applied at G, *fig.* 18; if an obstacle be placed at E, the force P will tend to push the roller over the obstacle, and will act with a lever equal to G F, and for all small obstacles G F may be considered equal to GD the diameter. The weight upon the roller pressing it down, acts with a lever equal to E F; but E F is equal to $\sqrt{GF} \times \sqrt{FD}$; therefore E r, which is equal to F D, remaining constant, and the diameter being increased, E F increases only as the square root of diameter, and consequently the force necessary to advance the roller is inversely as the square root of the diameter; that is to say, if a roller be increased four times in diameter, the resistance arising from the causes now under consideration will be reduced to $\frac{1}{\sqrt{4}}$ or $\frac{1}{2}$, and if increased nine times in diameter, the resistance will be only equal to $\frac{1}{\sqrt{9}}$ or $\frac{1}{3}$.

This being the only source of resistance to the action of a roller, it will easily be conceived that, in practice, by laying a plank, or any other plane surface, upon the ground, and preparing in like manner the lower surface of the body to be moved, and interposing rollers between the two, a very great weight may be moved with comparatively small power; but, on the other hand, there is a serious practical inconvenience attending the use of a roller, which prevents its adoption except in very particular cases.

A weight moved upon rollers proceeds at twice the rate of the roller, for if C, *fig.* 19, be the centre of the roller, D the point of contact with the ground, and E that with the weight to be moved, and W the weight, if this weight be put in motion, the point D is for an instant stationary, since it is in close contact with the ground. The diameter E C D moves, therefore, round the point D as a centre, and, consequently, E being twice as far from D as C is, describes E *e* twice as great a distance as C *c*; fresh points are now brought to the summit and in contact with the ground, and again the latter is stationary, while the former moves twice the distance which the point C does. The summit, therefore, or that point which is in immediate contact with the weight, always moves with twice the velocity of the centre of the roller; but the velocity of the centre is, of course, that of the roller, and the velocity of the point E, which is in contact with, and is moved by, the weight, is the same as that of the weight moved; therefore, as the weight is forced forward, it moves at twice the rate of the roller, it will gain upon the rollers, and others must be continually supplied in front—an inconvenience much felt in practice.

Fig. 19.



This confines the use of the roller to cases where the distance is very short, or where the weight conveyed is exceedingly great, and reduction in the resistance of more importance than the inconvenience alluded to.

The most remarkable instance of the application of rollers is the transport of the rock which now serves as the pedestal of the equestrian statue of Peter the Great at St. Petersburgh.

Fig. 20.

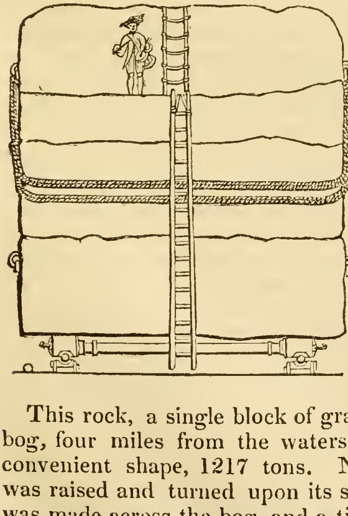
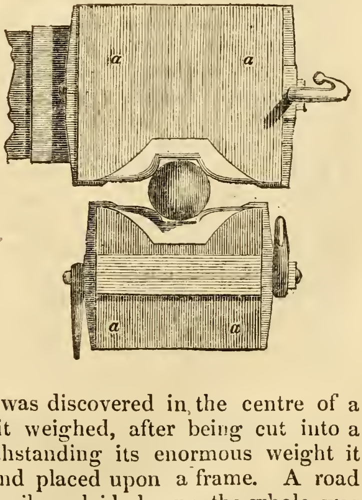
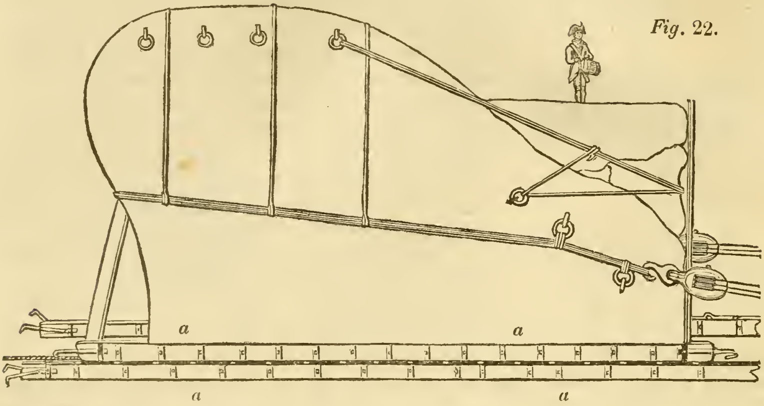


Fig. 21.



This rock, a single block of granite, was discovered in the centre of a bog, four miles from the waterside; it weighed, after being cut into a convenient shape, 1217 tons. Notwithstanding its enormous weight it was raised and turned upon its side, and placed upon a frame. A road was made across the bog, and a timber railway laid down; the whole was then left till the depth of winter, when the boggy ground was frozen and the operations then commenced. The railway consisted of two lines of timber *a a a a*, (figs. 20, 21, 22,) furnished with hard metal grooves; similar and corresponding metal grooves were fixed to the under side of the sledge, and between these grooves were placed the rollers, which were spheres of hard brass, about six inches diameter. The impossibility of confining cylindrical rollers to a perfectly parallel direction, and without which the friction would have been considerable, rendered the adoption of spherical rollers or balls running in a groove a matter of necessity, as otherwise the small surface upon which they can bear, and the consequent danger of crushing, or at least flattening that surface, is a serious objection to spheres: once placed upon the rollers, it was drawn by means of capstans. The resistance does not appear to have been great, considering the enormous weight, since sixty men at the capstans with treble purchase blocks moved it with ease.

Fig. 22.



The transport of this enormous rock under such disadvantageous circumstances of country, over a distance of four miles, and its subsequent passage of thirteen miles by water in a vast cassoon or vessel constructed for the purpose, was a work surpassing anything of the sort attempted by the ancients, and, indeed, in modern times the only thing which can be compared to it is the dragging a ship of the line up a slip ; the weight is in this case nearly the same as that of the rock, but the distance traversed is short, and the difficulties to be overcome much less. A plane of inclined timber is prepared and well greased; a frame of wood, technically called a cradle, is fixed under the vessel, it is floated on to the inclined plane and drawn up by the united efforts of a number of well-manned capstans, with powerful tackle: in this case no rollers are used; it is a sledge, the surface being well covered with grease to lessen the friction.

We have stated that there was a particular construction of roller which might be considered, as regards its form merely, an intermediate step between the roller and the wheel. It consists of a roller with the diameter of the extremities increased as in *fig* 23; the only advantage of this roller is that the body rests upon the small part of the roller, see *fig*. 24, and

Fig. 23.

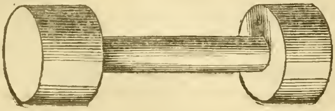


Fig. 24.

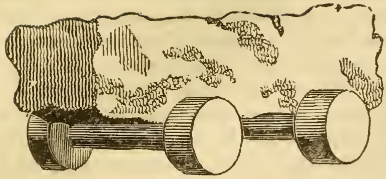
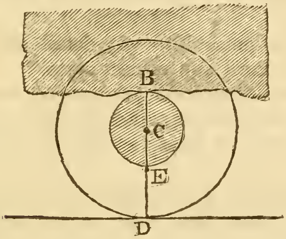


Fig. 25.



when put in motion, will not gain so rapidly on the rollers; or in other words, the roller will move with more than half the velocity of the body. A mere inspection of *fig.* 25, is sufficient to shew that the velocity of the centre, C, will be to that of the body resting on the point B, as C D to B D, so that if the ends of the rollers are twice the size of the intermediate part, C D will be equal to two thirds of B D, and the roller will move at two-thirds of the rate of the body; a less number of rollers are therefore required, and the resistance is somewhat diminished by having larger rollers in contact with the ground.

In using a roller of this sort, the idea may have struck the workman, or it may have occurred accidentally, to confine the spindle of the roller, and compel it to move with the body; and thus a clumsy pair of wheels, fixed to a spindle, would have resulted from his experiment. Such a supposition is quite gratuitous, as we have no record of any such contrivance having existed before wheels were made; indeed it is inferior both to the roller and the wheel: the only argument in favour of such a theory is, that rollers of this sort have been employed in comparatively modern times.

At Rome, in 1588, an obelisk, 90 feet high, of a single block of stone, weighing upwards of 160 tons, and which had originally been brought from Egypt, was removed from one square, in which it stood, to another in the Vatican, and there again erected in the spot where it now is.

In dragging this through the streets of Rome, it was fixed in a strong frame of wood, which rested upon a smaller frame, which were furnished each with a pair of rollers, or spindles, of the form above referred to; they were turned by capstan bars: indeed they cannot be better described than by stating that they resembled exactly the naves of a pair of cart wheels (all the spokes being removed), and fixed to a wooden axle. If a heavy waggon lay upon a pair of these, we can conceive that by putting bars into the mortices of the naves, we could force them round, and thus advance the waggon; but the resistance would evidently be greater than if either rollers or wheels were employed.

All the difficulties incidental to the use of the roller appear to be surmounted, and all objections met, by the contrivance of the wheel.

The wheel being attached to the load, or to the carriage which contains it, moves with it, is part of the machine, and consequently as we require only the number of wheels immediately necessary for the support of the load, we can afford to construct them of those dimensions and materials best suited to the purpose. By increasing their diameter, we are enabled to surmount impediments with much greater facility, as we have shewn in the case of the roller; and although there is a resistance arising from friction at the axle, which does not exist in the roller, yet this may be so reduced, by increasing the diameter of the wheel, as to form an inconsiderable part of the whole resistance, or draught of the carriage.

Of the first introduction of the wheel we have no record whatever.

The principle appears to us so simple as to have been necessarily the result of pure invention, almost inspiration; while, at the same time, it is so exceedingly effective and perfect, as hardly to admit of improvement.

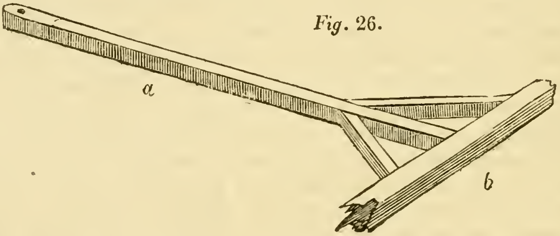
The great antiquity of wheeled carriages or chariots precludes all hopes of discovering their origin. About fifteen hundred years before the Christian era they appear to have been in common use amongst the Egyptians in the warfare. Pharaoh despatched six hundred chosen chariots in pursuit of the Israelites, immediately that he was informed of their escape, while the rest of the army followed with all the chariots of Egypt: here, therefore, they were in constant use, and serving as the cavalry of the present day.

Moreover the oldest records which enter into any detail of their construction described them in a very forward and perfect state.

At the siege of Troy, nearly three thousand years ago, they formed, according to Homer, the cavalry of the Greeks and Trojans; and every officer or hero of good blood possessed, at least, a pair of horses and a charioteer.

These chariots being built to run over broken ground, where no roads existed, were made low and broad, and they were by no means badly contrived for the purpose for which they were intended; the wheels were constructed with a nave and spokes, felloes and tires; and the pole, *a*, appears to have been fixed on the axle-tree, *b*, in the manner shewn in *fig.* 26. The body of the chariot was placed upon this frame. The team generally consisted, as we have before stated, of a pair of horses, attached to the pole; six and even a greater number of horses were, however, frequently harnessed abreast, but in that case a second pole was generally affixed to the axletree, so as to have a pair of horses attached to each pole, and the axletrees themselves were always made nearly as long as the whole width occupied by the horses.

Fig. 26.



They appear to have had light chariots for more domestic purposes, and four-wheeled carriages for conveyance of heavy goods; and certainly King Priam, when he went to the Grecian camp to ransom the body of his son Hector, travelled with some degree of comfort and luxury: he rode himself in a *beautiful new built travelling carriage*, drawn by favourite horses, while the treasures, intended as a ransom, were conveyed in a four-wheeled waggon drawn by mules. All these details, as well as the mode of harnessing the horses, which operation, it must be confessed, was performed by Priam himself and his sons, are fully described in the twenty-fourth book of the Iliad.

That Homer was well acquainted with the construction of the spoked wheel running freely upon the axletree, and, perhaps, even with the mode of hanging the body of the carriages upon straps for springs, in the same manner as the public coaches are to this day in many parts of France, and even in the neighbourhood of Paris, is evident from the passage in which he describes Juno's chariot. He there says, while Juno was putting the golden bits to the horses, Hebe fastened on the wheels to the iron axles. 'These wheels had eight brazen spokes, and the felloes were of gold, and the tires of brass.'—'The seat was fastened with gold and silver cords.'

This, of course, gives us Homer's ideas of perfection in a chariot.

All the epithets which could convey ideas of swiftness, were applied to these chariots and to the horses, but we have no positive information as regards the real velocity with which they would travel: as roads were scarce, and probably at best merely tracks, much could not be expected from vehicles constructed under such circumstances; the wheels were small, from 20 to 30 inches diameter, and all the parts of the chariots excessively heavy, so as to resist the repeated shocks to which they were subject.

The chariots represented upon the Frieze of the Parthenon, before alluded to, and which is probably upwards of 2200 years old, are very light in their construction, and only want springs to be called gigs.

The advancement of all the branches of the mechanical arts has necessarily introduced many improvements in the details of the construction of the wheel itself, as well as in that of the axle and the rest of the carriage, and by this means no doubt increased very greatly the use and advantage of it; but it is a remarkable fact, that these improvements have been confined exclusively to the workmanship and mechanical detail, and that the *principle* has remained exactly the same, and has not even received *any addition* during this immense lapse of time.

Upwards of 3000 years ago, the wheels appear to have been independent of each other and running upon fixed axles; we can say no more of the most improved wheel of the most finished carriage of the present day.

We are far from intending to cast any slight upon modern invention, or to compare the groaning axletrees and creaking wheels of the ancients with the noiseless Collinge's axles of the nineteenth century; but truth compels us to acknowledge that a period of thirty centuries, more than half the time which is supposed to have elapsed since the creation of the world, has produced no radical change nor brought into action any new principle in the use of the wheel as applied to carriages.

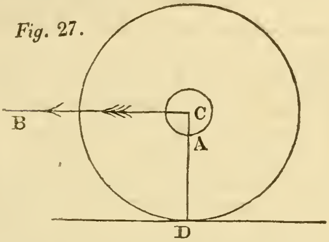
The particular form and construction of the wheel, as well as of all the other parts of the carriage, however, admit of great variety, and the draught is materially affected by their variation. We shall, therefore, after examining the action of wheels in general, describe the mode of construction now adopted, and then endeavour to point out the advantages and disadvantages of the various forms which have been given to the different parts of it.

First let us examine the theory of it, and suppose it acting on a level plain.

The wheel being a circle, the centre will remain always at the same height, and consequently will move parallel to the plane in a perfectly level line: if any weight be attached to or suspended from its centre, this will also move in a continued straight line without rising or falling, and consequently when once put in movement, there is nothing to check its progress (neglecting for the moment the slight resistance of the air), and it will require no force to keep it in motion so long as the wheels continue to turn.

We have therefore in this case only to examine into the force necessary to turn the wheels. The wheels, if left to themselves, would roll on with perfect freedom, whatever might be their weight, or whatever weight might be attached to them, provided nothing in the mode of attaching that weight impeded their revolution; but in practice we cannot admit of the load revolving with the wheel, and we have no means of suspending it to the wheel, except by means of an axle fixed to the load, and passing through the centre of the wheel. This axle presses upon the lower surface of the hole, and consequently when the wheel revolves causes a friction proportionate to the load upon the axle. This friction is then the only source of resistance to the motion of a wheel, under the circumstances here supposed; and it is the action of this friction, the degree in which it affects the draught, and by what means this effect is increased and diminished, that we are now about to consider.

Fig. 27.



Let C, *fig.* 27, be the centre of a wheel, of which C D is the radius, and C A that of the axle passing through the wheel, and which being fixed to the load does not revolve with the wheel.

If a force C B be applied to the centre of the wheel, tending to advance it in the direction B, the point D being in contact with the ground, the wheel is compelled to turn or roll, and the force C B in turning the wheel acts with a leverage equal to C D, but the friction between the axle and the wheel is at the point A, and in preventing the turning of the wheel it acts only at the extremity of the lever C A; consequently if C D be ten times as great as C A, the force C B need only be equal to one-tenth of the amount of the friction, and, as a general rule, the radius of the axle, and the friction remaining the same, the force necessary to overcome the resistance, arising from this friction, will be *inversely as the radius or the diameter of the wheel*, or, in other words, the draught will, in this case, diminish exactly in proportion as the diameter of the wheel is increased.

The exact *amount* of resistance occasioned by friction will depend upon the nature of the substances in contact at the axle, as well as upon the proportionate dimensions of the wheel and axle.

The friction between polished surfaces bears a certain proportion to the pressure: if the pressure is doubled, the friction will, within certain limits, be also doubled; but the proportion between the friction and the pressure is only constant so long as the same substances are employed: it varies very much with different substances. Thus, with soft wood sliding upon soft wood the friction amounts to one-fourth or one-third of the pressure, while between hard brass and iron, the surfaces smooth and oiled, the resistance may be as low as $\frac{1}{30}$ of the pressure. The relative advantages, therefore, of different materials, as applied to the axle and box of a wheel, is a point of much consequence.

Metals, generally speaking, are the best adapted for this purpose. Owing to their hardness, the friction between them is small, and they will bear without injury a greater pressure, proportionably to the surface; and, from their strength, the axle may be of much smaller dimensions than if made of wood; and we have proved that a reduction in the diameter of the axle causes a proportionate reduction in the resistance caused by friction. In consequence of these advantages, iron or steel axles, working in iron boxes, are now almost universally adopted. The friction in this case, when the parts are in proper order, greased, and the pressure upon them not excessive, amounts to about one-eighth, or, at the most, one-fifth of the pressure or weight; suppose it one-sixth, and if the diameter of the wheel is to that of the axle as 18 or 20 to 1, which is about the proportion in a large two-wheeled cart, the whole resistance arising from friction at the axle will be equal to $\frac{1}{6}$ of $\frac{1}{18}$, or of $\frac{1}{20}$, which is equal to $\frac{1}{108}$ and $\frac{1}{120}$ respectively. So that to move one ton would not, in the latter case, require a force of traction greater than 18½lbs.; and having overcome this resistance, the force of traction required remains nearly the same at all velocities; that is to say, friction is not materially affected by velocity: therefore the resistance arising from it is not sensibly augmented by a considerable increase in the speed. In practice, however, the friction at the axle is far from being the greatest impediment to the motion of a carriage. We have hitherto, for the purpose of considering friction alone, supposed the surface upon which the wheel moved as perfectly hard, smooth, level, and plane: we need hardly say that such can never be the case in a road. The friction, however, remains, practically speaking, the same, and the laws which govern the amount and the effects of it remain unaltered; and we have only to ascertain what is the additional resistance, arising from other sources, to obtain the whole draught of the carriage. We have already stated, when pointing out the difference between the roller and the wheel, that the movement of the latter was attended with two sources of resistance, viz., friction at the centre, which we have considered, and another, which is common both to the wheel and the roller, arising from impediments in the road, or the yielding of the materials.

The laws which affect the amount of this latter are, of course, the same in a wheel as in a roller.

We have found that the power required to overcome it is inversely as the square root of the diameter; therefore, by increasing the diameter of the wheel, the effect of friction, which is inversely as the diameter, diminishes much more rapidly than that caused by impediments in the roads; and on ordinary roads, with common carts, the amount of the latter is about three times as great as that of the former, and when the roads are at all injured by weather or by neglect, or if they are naturally heavy or sandy, it bears a much greater proportion. A light four-wheeled cart, weighing, with its load, 1000lbs*, was repeatedly drawn upon different sorts of roads, the average of a number of experiments gave the following results:

Description of Road.	Force of Traction required to move the Carriage.
Turnpike road,—hard, dry	30⅓lbs.
Ditto dirty	39
Hard, compact loam	53
Ordinary by-road	106
Turnpike road—new gravelled	143
Loose, sandy road	204

The friction at the axles, which were of wood, was, of course, nearly constant, and probably absorbed at least $\frac{1}{80}$ of the weight, or 12½lbs. of the force of traction, leaving, therefore, for the resistance caused by the road in the different cases, as under—

Description of Road.	Force of Traction required to move the Carriage, independent of the Friction at the Axles.
Turnpike road—hard, dry, about	18 lbs.
Ditto dirty	26½
Ditto new gravelled	130½
Loose, sandy road	191½

so that in the last case, one by no means of rare occurrence in many parts of the country, the portion of draught immediately caused by the state of the roads was ten times as great as on a good turnpike road, and about fifteen times as great as that which arose from friction at the axles. It would be hopeless to attempt to remedy this by increasing the size of the wheel : the experiment was made with wheels of the ordinary size. To double their diameter would evidently be attended, in practice, with insurmountable difficulties; and yet, even if this were effected, it would barely reduce the total amount of the draught by one-fourth ; but the form of the wheel may materially influence the state of the road, we shall, therefore, proceed to consider the various forms employed.

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* The experiment was not made with a load of exactly 1000lbs., but the proportions of the results are calculated to this standard. The public are indebted to Mr. Bevan for these as well as a great number of other highly useful and practical experiments upon the effects of power in various cases.

Some years ago, when the principal turnpike roads of the kingdom were at many parts, at particular seasons of the year, in little better condition than that on which the last experiment was tried, various attempts were made to reduce the resistance, by using narrow wheels. These attempts, and the laws which it was found necessary to enact to prevent the entire destruction of the roads, led, at last, to curious results, having gradually caused the introduction of the worst-formed wheel which could probably be invented, either as regards increasing the draught or the destruction of the roads.

To understand these alterations clearly, we must describe the principal features of the wheel now in use.

The general construction of it presents a striking instance of strength arising from the judicious union of substances of very different qualities—wood and iron.

A strong circular frame of wood, composed of different segments, called felloes, is bound together by a hoop, or several hoops of iron, called tires, which thus, at the same time that it gives great strength, protects the outer surface from wear.

The nave, a circular block of wood, is sustained in the centre of this frame by the spokes, which, instead of being in the plane of the felloes, form a cone : this is called the dishing of the wheel. The object of it is to give stiffness, to resist lateral shocks, as when the wheel slips sideways, into a rut or hole. A reference to a comparative view of the wheel, with and without dishing, will more clearly explain our meaning. *Fig.* 28, is a wheel with the spokes all in one place ; *fig.* 29, a wheel with a considerable degree of dishing.

Fig. 28.

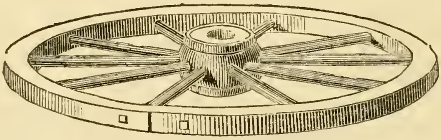
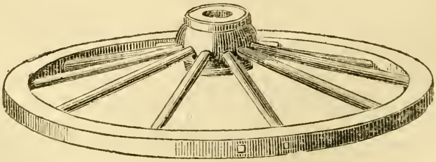


Fig. 29.

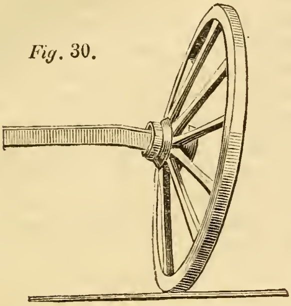


Here it is evident that a small pressure on the nave in fig. 29, would have a tendency to push it through, and would meet with but little resistance.

In fig. 30, on the contrary, this force would be opposed at once by the direction of the spokes, which form an arch, or dome, that cannot be flattened without bursting the felloes, or tires. The dishing, therefore, gives the wheel a very great degree of stiffness and strength, which it would not otherwise possess.

In consequence of this conical form, the necessity of keeping the lower spokes which support the weight as vertical as possible, has required that the whole wheel should be placed oblique, and the axle bent downwards, as in *fig.* 30: this, as we shall hereafter show, is attended with very serious evils. As a wheel is intended to roll upon the ground, without friction, it is natural to suppose that the outer surface of the tires should be cylindrical, as it is the only form which admits of the wheel rolling freely in a straight line; but it is nevertheless the form of this surface, its breadth, and the degree of dishing which have varied so much from the causes before mentioned, viz., the state of the roads, and to the consideration of which we will now return.

Fig. 30.

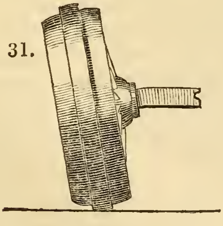


A road, however much neglected and out of repair, will generally have, at a certain depth, a hard bottom; above this will be a coat of mud of loose stuff, more or less deep, according to the material used, and the frequency of repair or the quantity of wet to which it may be exposed. It is sinking through this, until it reaches the hard bottom, that causes the resistance to the progress of the wheel: whether the wheel be wide or narrow, it must squeeze or grind its way to the bottom of this mud; a narrow wheel evidently displaces less, and therefore offers less resistance. The great object of carriers, then, was very naturally to place as great a load as they could upon wheels, which were as narrow as possible, consistent with the necessary strength.

It was soon perceived that the entire destruction of the roads would be the consequence of this very system, which had its origin in the bad state of the roads. A certain width of tire proportionate to the load was therefore required by law. The endeavour to evade this law was the cause of the absurd form of wheel we are about to describe and to condemn.

In apparent obedience to the law, the felloes of the wheels were made of an excessive breadth; but to retain the advantages of the narrow wheel, the middle tire was made to project so far beyond the others, (see *fig.* 31,) that it in fact constituted the wheel, the others being merely to give a nominal, and not a real width. The enormous loads which it was found advantageous to place on these wheels rendered it necessary to give them a considerable degree of dishing, to resist lateral shocks, and, besides, the carriers were by this means enabled to give a great width of floor to the carriage, still keeping the vehicle in the common tracks or ruts, so that the wheels ultimately assumed the form represented, *fig.* 32.

Fig. 31.



If such a machine had been constructed, for the express purpose of grinding the materials of the road to powder, or of serving as a check, or drag, to the waggon, it might, indeed, have been judicious, but as a

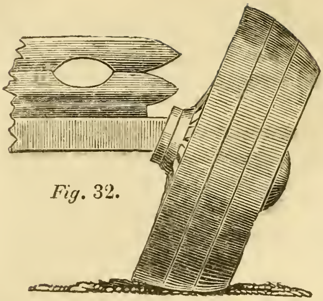


Fig. 32.

wheel it was monstrous. Yet this is the form of wheel upon which the contradictory opinions referred to in the first page of this treatise, were given before a Committee of the House of Commons. A carrier of Exeter advocated these wheels, and, in support of his opinion, adopts them to this day. But a few days ago we saw one of his waggons with wheels which, although only about twelve inches wide, were six inches smaller at the outside than at the inside. Such a cone, if set a rolling and left to itself, would run round in a circle of little more than twenty feet diameter. What must be the grinding and the friction, then, when it is constantly compelled to go on in a straight line? yet enough has been written and said upon this subject to convince, we should imagine, the most prejudiced of the absurdity of the system.

We shall repeat the principal arguments which were made use of at the time of the inquiry mentioned.

Mr. Cummins took great pains, by constructing models, to show that conical wheels were not adapted for rolling in a straight line, by making a small conical wheel run over longitudinal bars, as in *fig*. 33. It was seen that if the middle part of the tire rolled upon the centre bar without moving it, the bar A was pushed backwards, while the bar C was pushed forwards; clearly shewing if, instead of sliding bars, the wheel had moved upon a road, how much it must have ground the road, and what a small portion of the tire was truly *rolling*.

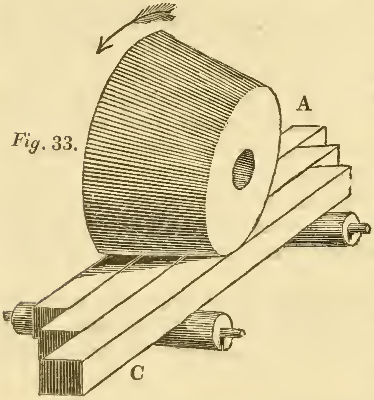


Fig. 33.

That such must have been the case is, indeed, easily proved without a model. We will take only three different parts of the wheel and consider them as independent hoops of different diameter; if these hoops are compelled to go the same number of revolutions, the large one will evidently gain upon the second, while the third will be left far behind. Now, if, instead of being independent of each other, they be fixed to the same axle, and compelled to revolve together, the large one not being able to advance faster than the others, must tear up the ground. The smaller one, on the contrary, being dragged forward faster than it would naturally roll, must drag up the ground; and this is what must take place, and does, with any but a cylindrical wheel, and that to a very considerable extent.

Suppose, for instance, a conical wheel, of an average diameter of five feet; that is to say, that the centre advances about fifteen feet to every revolution of the wheel. If the inner tire be six inches larger in diameter than the outer tire, the circumference of it will be about eighteen inches greater; therefore, at each revolution of the wheel the inner tire would naturally advance eighteen inches more than the outer tire: but they are compelled to go over the same distance of ground. The one or the other, therefore, must have disturbed the ground, or, what is nearer the truth, upon every fifteen feet run of road, the former has passed over nine inches less ground than the development of its circumference, the latter nine inches more—the one pushing back the ground, the other dragging it forward.

Every child knows that the front wheel of a carriage goes oftener round than the hind wheel. If, then, the front wheel were obliged to make only one revolution to every revolution of the other, but still impelled at the same rate, it must be partly dragged over the road. If these wheels be placed side by side, instead of one being in front of the other, the effect must be the same. Now, suppose them to be the outer and inner tire of the same wheel, the circumstances are not thereby altered : the smaller circle and the larger circle cannot both roll upon the ground. A conical wheel is then constantly twisting the surface upon which it rests, and hence arises a very considerable resistance, as well as destruction to the roads.

If these arguments are not sufficient to decide the point completely, let the reader bear in mind simply, that a cone, when left to itself, will always roll in a circle. The frustrum of a cone, AB, *fig.* 34, is only a portion of the entire cone, ABC, which will roll round the point C ; if this entire cone be completely severed at the point B, the two parts will still continue to roll round the same point, and if the portion BC be now abstracted, the motion of the remainder will not be altered. If a wine-glass or decanter, anything which is not of the same size at the two parts which are in contact with the surface on which it rests, be rolled upon a table, those who are not already too familiar with the fact to require an illustration of it, will immediately see the truth of this statement. If, then, a wheel thus formed would naturally quit the straight line ; when compelled to follow it, it is clear that exactly the same effect must be produced as when a cylindrical millstone, as in *fig.* 35, which would proceed in a straight line, is compelled to follow a curved line, and is constantly twisted round the centre C, it would grind everything beneath it to powder. Yet these travelling grindstones have been in use upwards of twenty years, to the destruction of the roads, and at a great expense of power to those who have persisted in employing them.

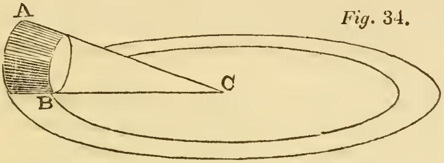


Fig. 34.

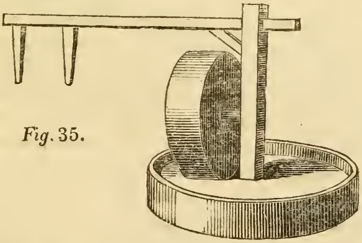
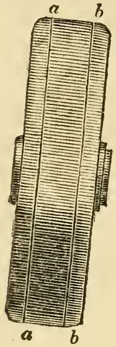


Fig. 35.

The increased strain upon the axles, from this constant tendency of the wheel to be twisted outwards, with the consequent friction, is a source of resistance absorbed and rendered comparatively inconsiderable, by the far greater friction on the ground ; but it is not the less a cause of great increase of draught, and the union of all these serious disadvantages justifies, we think, our assertion, that such a wheel is as injudicious a contrivance as could possibly be invented. We trust they will not long continue to disgrace our wheelwrights, and injure our roads.

We hope that none of our readers will consider that we have wasted our arguments upon a point too self-evident to require proof. In reply to this, however, we will state that, at the last meeting of the parties interested in the management of a considerable portion of a principal road in the middle of England, the question was considered, and it was agreed to encourage the use of conical wheels, as at least equal to, if not superior to cylindrical ones, by allowing them to run at a less toll than that required by act of Parliament.

Fig. 36.



The cylindrical form is the only one which ought to be admitted. As a wheel must, however, always be liable to sink a little into the road, and cannot be expected always to bear perfectly flat upon the ground, the surface of the tires should be slightly curved, and the edges rounded off, as in *fig.* 36. As the rounding is rendered necessary by the yielding of the road, its degree must depend upon the state of the road, and the form of the wheel may approach more nearly to the true cylinder, in proportion as the roads approach nearer to perfection in point of hardness and flatness. When the roads are good, a very little dishing will be sufficient, and a slight inclination of the wheel from the vertical will make it correspond with the barrel or curve of the road, which is now generally very trifling.

Next to the form, the breadth of the wheel is the point requiring most consideration: it is one, however, which depends entirely upon the state of the road.

We have seen, that the displacement or crushing of the materials forming the upper surface of the road is one of the principal causes of resistance. If the whole mass of the road were formed of a yielding substance, into which the wheel would sink to a depth exactly proportionate to the weight bearing upon it, it is probable that great breadth would be advantageous, so that the wheel might form a roller, tending to consolidate the materials rather than cause any permanent displacement; but, in the improved state of modern roads, it may safely be considered that such is never the case.

A road, as we have before stated, always consists of a hard bottom, covered with a stratum, more or less thick, of soft, yielding material. A wheel, even moderately loaded, will force its way through, and form a rut in this upper coating. The resistance will be nearly proportionate to the breadth of this rut; the depth of it will not increase in the ratio of the pressure. In considering, then, simply, the case of a single wheel or a pair of wheels forming two distinct ruts, it is evident that it should form as narrow a rut as possible, but that it should not in any degree crush or derange the core or hard basis of the road. When a rut is thus formed, a small track or portion of the road is for a time rendered clean and hard, and consequently capable of bearing a greater load than before, and with less injury. It is, then, highly important in a four-wheel carriage that the hind wheels should follow exactly in the track of the front wheels. If rollers were necessary for the road, as if, for instance, it was merely a bed of clay, then indeed, but only in such a case, would it be judicious to cause the wheels to run in different tracks, as has been proposed, and was carried into effect under the encouragement of an act of parliament. Such wheels were called straddlers: they might have been necessary tools for the preservation of such roads as then existed, but the increased draught soon taught the public to evade the law which encouraged them.

Mr. Deacon, one of the principal carriers in England, in an excellent practical work on wheel-carriages, published in 1810, describing these wheels, says, ‘ If the axle of a six-inch wheel is of that length to cause the hind wheels to make tracks five inches outside, the tracks of the fore-wheels, and nine-inch wheels seven inches outside, they are then called straddlers, and are allowed to carry a greater weight than if not so. The original intent of these was most excellent; but the effect has been defeated by the carrier or other person not only making the bed or axle contrary to what was intended, but also by carrying with them a false collar, with a joint therein, to put on and take off at pleasure; so that they have no great difficulty in making the wheels straddlers a little before they come to a weighing machine, and making them not so when they have passed the same.'

On modern roads such an arrangement would hardly be beneficial even to the road itself, and would nearly double the amount of draught.

Too great care and precaution cannot be taken to insure the wheels running in the same track. Let it be remembered that, on a good road, the forming the rut is the cause of three-fourths, and oftener five-sixths of the whole resistance. Narrow wheels, therefore, running in the same track, without doubt offer the least resistance, provided there is surface sufficient to bear the weight, without destruction to the foundation of the road.

Six inches in breadth of the flat or cylindrical part, *a b*, fig. 36, independent of the rounded edges, will be quite sufficient, in a wheel of ordinary size, to bear a ton without injury to the roads, if in good condition; and according as the weight upon each wheel is more or less than this, the breadth should be proportionably increased or diminished.

While upon the subject of wheels, it may be as well to state the several new modes of constructing wheels lately introduced, which severally possess their merits and disadvantages. The last improvement is that known under the name of 'Jones' patent wheels.

It consists in making the felloe of a single ring of cast iron. The nave, which is also of cast iron, is *suspended* in the centre by eight wrought iron rods: these rods are crossed or alternately dished inwards and outwards, to give stiffness, which is thus obtained without affecting the cylindrical form of the whole.

Fig. 37 and 38, represent different views of this wheel, F F being the cast iron felloe, S S the spokes, and N the nave.

These wheels have been adopted to a great extent in London, and therefore we may conclude that they are found to answer; but they are

Fig. 37.

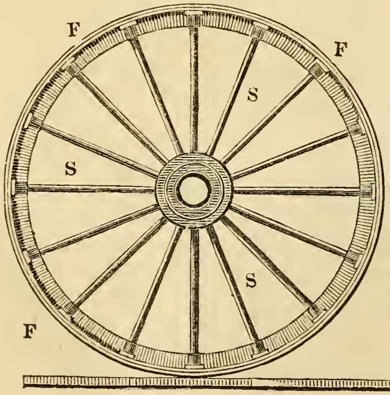
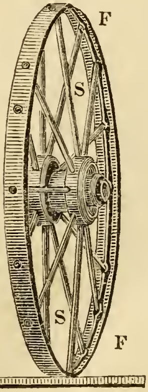
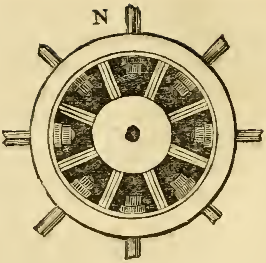
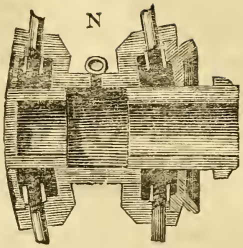


Fig. 38.







expensive, and not easily repaired, except at the original manufactory, and therefore we should think are not so well adapted for agricultural as for commercial purposes, and in a large town where the means of repair may be at hand.

The most simple innovation upon the original wooden wheel is the cast iron nave. This we should think must be much less liable to wear than the wooden nave, which is literally honeycombed with the mortices for the spokes; and a wheel of this sort can be repaired by the most ordinary wheelwright, provided he has one of the castings at hand.

We should strongly recommend that these naves should be made with a double row of sockets for the spokes, so as to cross the dishing of them in the same manner as those of the wrought iron wheels described above; and we think they would then form a strong, durable, and economical wheel. There might be some danger from the effects of wet or damp remaining in the cast iron sockets, and attacking the wood; but we should think a small hole bored into the socket to allow the moisture to escape, and common precaution in painting these parts, would prevent any evil consequences.

With respect to the size of wheels, we have shown that wheels of large diameter certainly offer less resistance than small ones; but expense and weight cause a limit to this. From 4 ft. 9 in. to 5 ft. 6 in. is a good size for cart-wheels, and is about the limit where any great increase of diameter would cause more inconvenience and expense than would be compensated for by any advantage gained; and if much less in diameter than this, the draught is unnecessarily augmented.

Yet the front wheels of a waggon are always below this standard, rarely exceeding four feet, and frequently much less. This is a serious evil attending the use of four wheels; it is an arrangement originally made for the purpose of enabling the front wheels to lock under the body of the waggon, which may thus turn in a small space.

Now it rarely happens that a waggon is required to turn short round, and it cannot cause any serious inconvenience if it be rendered altogether incapable of doing so.

In this respect a great improvement has taken place within a few years. In the place of those moving mountains which were formerly dragged slowly along upon immensely heavy and broad, but low, wheels, we now see, particularly on the roads leading northward from London, a great number of light, well-built waggons, with much larger wheels, especially the front wheels, which, instead of being small enough to turn under the floor of the waggon, are about four feet six inches in diameter. As those waggons are used only on the road, and are never required to turn in a small compass, but a very small action is allowed to the fore axle, and the floor and body of the waggon is continued from end to end of nearly the same width.

A waggon with part of the floor and body cut away, so as to form a sort of recess for the front wheels to turn into, allows of all the movements that can be required, except in the crowded streets of a town, and by this arrangement there is nothing to prevent the front wheel being made of large diameter, as in the case just described. Our present object, however, is not to enter into a detailed description of how we should build a waggon, but simply to recommend the use of large front wheels, as tending much to diminish the draught. An intelligent wheelwright will always know how to construct a waggon so as to admit of this.

The consideration of the subject of the wheels naturally includes that of the comparative advantages of two-wheeled and four-wheeled carriages. Upon this point opinions differ as much as upon any of those we have already considered; and we fear that we are not likely to do more than to arrange the different opinions given by others, without advancing any of our own. If we succeed, however, in doing this clearly we shall have done much, because we may thus enable each individual to separate those arguments which apply particularly to his own case; and combining these opinions with his own judgment, he will be more likely to arrive at a just conclusion, than if he were altogether unaided by the experience of others.

The advocates of light two-wheeled carts assert that a horse working alone is capable of performing more work than when forming one of a team; and that in consequence of this increased effect, there is a saving of expense nearly in the proportion of three to two, or one-third.

The advocates for waggons assert, on the contrary, that it requires that each horse in a single-horse cart should be of a superior quality, and, therefore more expensive than those of a team, where the average power only is considered; that the wear and tear, first cost, and expense of attendance of several small carts, is greater than that of a waggon carrying the same load, and that in consequence there is an economy obtained by the latter in a proportion of about four to three.

Numbers of facts and the results of long experience are adduced on either side, all of which convey much useful information, and the substance of the whole appears to be, that with light single-horse two-wheeled carts, good horses are able to draw greater loads, and do more work in proportion than a waggon team; that these carts are easier loaded and unloaded, do less injury to the roads, and that they do not require more horses in action than are sufficient for the work to be performed.

On the other hand, it is found that the horses must be stronger and better fed; that being entirely dependant on their own exertions, although doing more work, they are more fatigued, and sooner knocked up; that on rough roads they are liable to be shaken and injured by the sudden movements and shocks of the cart, all of which are conveyed by the shafts directly to the horse; that in ascending or descending hills the whole weight being above the axle-tree, it destroys the balance, and is thrown too much upon the horse in the former case, or tends to raise him from the ground in the latter, which even if any alteration of the balance be found advantageous, is exactly the contrary of what would be necessary.

That with a waggon—the average power of several horses is obtained—horses of inferior quality may therefore be used;—they are not so much fatigued, because by relieving each other they can alternately exert themselves or relax. Greater loads can be carried with less attendance of drivers, and they are less liable to accidents; they are easier withdrawn from any hole, or forced over any obstruction, because only half the load being upon each pair of wheels, the whole force of the team is applied successively to each half of the load, consequently in any bad road the power occasionally required is less, although the draught of the carriage, properly speaking, is greater than that of a two-wheeled cart. These various arguments would appear to lead to the conclusion, that upon good roads, and for short distances, with good horses, two-wheeled single-horse carts are the best;. but that, with inferior roads and ordinary horses, light four-wheeled waggons, with a team of three or four horses, are the most advantageous.

Two-wheeled carts with two horses are decidedly inferior to either of these: the shaft horse suffers all the inconveniences complained of in the single-horse cart, and the leader does not produce more effect than when in a waggon team.

It is impossible to decide generally upon the comparative merits of the different arrangements, because the result depends entirely upon the circumstances of the case.

We may, however, endeavour to unite in some degree the advantages claimed by both. The draught of a cart is less than that of a waggon for several reasons: amongst others, because the wheels are larger and the horse produces more effect, because his force is applied immediately to the resistance. A light waggon with large front wheels would not be much inferior in point of draught to the cart, and two horses abreast in double shafts would work with equal advantage to the single horse; while an additional horse may always be applied when an excessive load or the state of the roads should require it.

All that we have said with respect to the size and contrivance of wheels is equally applicable to light carriages as to heavy, and we shall now proceed to consider the different modes of placing the loads upon the wheels.

It might appear at first sight that this would not affect the amount of the draught; that provided a weight to be moved were placed upon the wheels, and the wheels put in motion, that nothing more could be required. Upon a perfectly level smooth plane, and with a constant force of traction, this would, indeed, be the case; but, in practice, the conditions are entirely altered. Impediments are continually met with which obstruct the progress of the wheels, and the draught is constantly varying by the different inclinations of the road: it is, therefore, necessary to study the means by which impediments can be easiest overcome, and by which the resistance thus caused will affect the animal, which is the source of power, in the least disadvantageous manner.

We have, in the commencement of this treatise, proved, that impetus is necessary to overcome an obstruction, and that elasticity *in the direction of the movement* is destructive of the full effect of impetus.

When, therefore, the wheel of a carriage comes in contact with any impediment, it is most essential that the whole of the impetus or momentum which the carriage has already obtained, should be brought into full action, to force the wheel forward. To effect this, no elasticity should intervene between the wheel and the load, at least, in the direction of the motion that is longitudinally; otherwise, as we instanced in the case of catching a cricket-ball, a force which would be quite irresistible if opposed by a rigid resistance, is checked with ease by a very little degree of elasticity; so with a wheel meeting a small stone, if the load were so placed, or hung upon the wheels, as to allow free or elastic action longitudinally, that is, in the direction of the movement, the wheel being stopped against the stone, the whole load would be gradually checked, and brought to a full stop;

whereas, if this same load had been fixed firmly to the wheel, its impetus would have carried the wheel over the stone, with very little loss of velocity.

In the first case, it would be necessary for the horses to drag the load over the stone by main force; in the latter, they would only have to make up by degrees for the loss of velocity which the mass had sustained in passing over the stone. The *quantity* of power required will indeed be the same in either case; but in the one, the horses must exert it in a single effort, while in the other, this momentary exertion is borrowed, as it were, from the impetus of the mass in motion, and being spread over a greater space of time, as far as the horses are concerned, only augments in a small degree the average resistance. It is thus that the fly-wheel of a steam-engine in a rolling-mill, accumulates power, sometimes for several minutes, till it is able to roll, with apparent ease, a large mass of metal, which, without the effect of the fly-wheel, would stop the engine immediately; or, to mention a case more to the point, in the operation of scotching a wheel, a large stone, and even a brick, will render almost immoveable a waggon, which, when in motion, would pass over the same stone, without any sensible alteration of speed. It is most essential, therefore, that the effect of the momentum of the load should in no way be reduced by any longitudinal elasticity, arising either from the injudicious application of springs, or weakness in the construction of the carriage.

The action of impetus, and the effect of an injudicious mode of hanging the load, is of course more sensible at high than at low velocities, and in a carriage hung upon springs, than in a waggon without springs, but although not so sensible to the eye, it nevertheless affects the draught materially even in the latter case. Carriages hung upon springs, as in *fig.* 39, which are called C springs, and which admit of very considerable longitudinal movement in the body of the carriage, are notoriously the most heavy to pull; and cabriolets which are hung in this manner, are expressively called in the stable, horse murderers, and require heavy powerful horses to drag them, while lighter animals are able to drag much greater weights in Stanhopes and spring-carts, which do not admit of this elasticity.

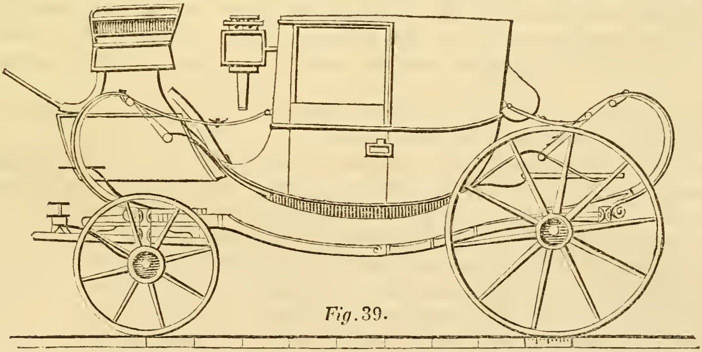


Fig. 39.

This is one of the reasons why the draught of a two-wheeled cart is less than that of a waggon. In a cart, the horse pulls at once on the shafts, which are fixed immediately both to the load and to the axletree, so that not only the impetus of the load, but also of the horse, acts directly and without elasticity upon the wheel. In a waggon, owing to the smallness of the front wheels, there is a considerable space between the fore-axle and the floor of the waggon, which is filled up with pieces of timber, called bolsters, this admits of considerable play in the parts, and except in new-built or very strong waggons, there is never that firm connexion between the load and the wheels, which we have stated to be necessary. Large wheels would bring the axletrees much nearer the floors of the waggons, and, therefore, admit of a much stronger and firmer mode of attachment, which would be found to produce a very considerable effect in diminishing the draught.

We have been very particular in confining our observations to longitudinal elasticity, or yielding in the direction in which the power is applied, and in which the progressive movement takes place; because, elasticity in any other direction, instead of increasing the draught, tends very much to diminish it. Let us suppose the load placed upon perfectly easy springs, which allow it to move freely in every direction, except longitudinally, when any one of the wheels comes in contact with a stone, the elasticity of the spring will allow it to run over the stone without sensibly raising the load which is upon it, and the force which is required to pull the wheel over the stone, will be restored again by the descent of the wheel from the stone, which will tend to impel the mass forward, with exactly the same force as was required to draw it up to the top of this impediment; without this elasticity it would be necessary to raise the whole load with a sudden jerk, and thus instantaneously impart rapid movement to the whole mass, which would absorb much power, and which would by no means be returned by the load falling down from the stone. We see, therefore, that the use of springs is to enable the wheels to rise and fall according to the inequalities of the ground, while the load continues one constant equable motion. The advantages of this action are very clearly pointed out, in a letter addressed to the Committee on the Highways of the Kingdom, by Mr. D. Giddy, and given in the Appendix to their first Report, printed in the year 1808; and this letter explains so clearly, and in such few words, the whole theory of wheels, as well as springs, that we think we cannot do better than quote it at length.

‘ Taking wheels completely in the abstract, they must be considered as answering two different purposes.

‘ First, They transfer the friction which would take place between a sliding body, and the rough uneven surface over which it slides, to the smooth, oiled peripheries of the axis and box, assisted by a leverage in the proportion of the diameter of the wheel to the axis.

‘ Secondly, They procure mechanical advantage for overcoming obstacles, by introducing time proportioned to the square roots of their diameters, when the obstacles are small as compared with the wheels; and they pass over transverse ruts or hollows, small in the same comparison, with an absolute advantage proportioned to their diameters, and a mechanical one proportionate to the square roots of these diameters.

‘ Consequently, wheels thus considered, cannot be too large; in practice, however, they are limited by weight, by expense, and by experience.

‘ With reference to the preservation of roads, wheels should be made wide, and so constructed, that the whole breadth may bear at once; and every portion in contact with the ground, should roll on without any sliding.

‘ It is evident from the well-known properties of the cycloid, that the above conditions cannot all unite, unless the roads are perfectly hard, smooth, and flat; and the felloes of the wheels, with their tire, are accurate portions of a cylinder. These forms, therefore, of roads and wheels, would seem to be asymptotes, towards which they should always approximate, but which, in practice, they are never likely to reach.

'Roads must have some degree of curvature to throw off water, and the peripheries of wheels should, in their transverse section, be as nearly as possible tangents to this curve; but since no exact form can be assigned to roads, and they are found to differ almost from mile to mile, it is presumed, that a small transverse convexity given to the peripheries of wheels, otherwise cylindrical, will sufficiently adapt them to all roads; and that the pressure of such wheels, greatest in the middle, and gradually diminishing towards the sides, will be less likely to disarrange ordinary materials, than a pressure suddenly discontinued at the edges of wheels perfectly flat.

'The spokes of a wheel should be so arranged, as to present themselves in a straight line against the greatest force they are in common cases likely to sustain. These must evidently be exerted in a direction pointed towards the carriage, from lateral percussions, and from the descent of either wheel below the level of the other: consequently, a certain degree of what is termed dishing, must be advantageous, by adding strength; whilst this form is esteemed useful for protecting the nave, and for obviating the ill effects of expansions and contractions.

'The line of traction is theoretically best disposed, when it lies exactly parallel to the direction of motion; and its power is diminished at any inclination of that line, in the proportion of the radius of the wheel to the cosine at the angle. When obstacles frequently occur, it had better, perhaps, receive a small inclination upward, for the purpose of acting with most advantage when these are to be overcome. But it is probable, that different animals exert their strength most advantageously in different directions; and, therefore, practice alone can determine what precise inclination of the line is best adapted to horses, and what to oxen. These considerations, are however, only applicable to cattle-drawing immediately at the carriage; and the convenience of their draft, as connected with the insertion of the line of traction, which continued, ought to pass through the axis, introduces another limit to the size of the wheels.

'Springs were in all likelihood first applied to carriages, with no other view than for the accommodation of travellers: they have since been found to answer several important ends. They convert all percussions into mere increase of pressure; thus preserving both the carriage and the materials of the roads from the effect of blows; and small obstacles are surmounted when springs allow the frame and wheels freely to ascend, without sensibly moving the body of the carriage from its place.

'If the whole weight is supposed to be concentrated on springs very long, extremely flexible, and with the frame and wheels wholly devoid of inertia, this paradoxical conclusion will most certainly follow: that such a carriage may be drawn over the roughest road without any agitation, and by the smallest increase of force.

'It seems probable that springs, under some modification of form and material, may be applicable with advantage to the heaviest waggon.'

And there can be no doubt, that, in the words of the writer, the application of springs would be highly advantageous. At high velocities, as we have before said, the effect of springs is still greater. What we have instanced as regards springs, is generally well known and understood. All stage-coaches, and many travelling carriages, hang upon grasshopper springs, which allow of perpendicular without any longitudinal action. It would be much to the interests of horse masters if the mode of suspending post-chaises were a little more attended to. The more elasticity, or in other words, the more action, there is in grasshopper springs, the more effect will it produce in diminishing the draught: with a C spring a very contrary effect is produced.

A carriage hung upon C springs may certainly be made the most comfortable to the rider, but all the ease that can be required, and much more than is found in the generality of post-chaises, may be obtained by well-constructed grasshopper springs, and with considerable advantage to the horses.

The practice of loading coaches as high as possible to make them run light, as the coachmen have found by experience, is only a mode of assisting the springs. The mass being placed at a greater height above the wheels, acting at the extremity of a longer lever, is not so easily displaced laterally by any motion of the wheels, which, therefore, may rise and fall on either side as they run over the stones, without producing any sudden concussions upon the load, which swings to and fro with long, easy movements; it is probable also, that the weight, being thus swung from side to side, may, upon good roads, diminish the draught, as it is in fact generally running upon two of the wheels; while, in the other direction, it equally admits of the front and hind wheels successively passing over any impediments; and yet, by the manner in which it is fixed upon the springs, it does not admit of any longitudinal elasticity.

The fact of coaches thus loaded running light has been clearly proved by the failure of what were called Safety Coaches, in which the only difference consisted in placing the load very low. These coaches, although completely answering their purpose of safety, were discontinued solely, we believe, from their being found destructive of the horses.

Experiments, nevertheless, have been made to prove that this was only an idle prejudice of coachmen; but universally received opinions, even if leading to erroneous conclusions, which is hardly possible, must always have some good foundation; and coachmen, although they may not have been so much so at the time these experiments were published (in 1817), are certainly now rather an intelligent class of men. We should, therefore, prefer risking a theory, if a theory were necessary, in support of their prejudices rather than in opposition to them. The experiments alluded to were not, in our opinion, made under the circumstances which occur in practice. Small models (the wheels being seven inches in diameter) were drawn along a table across which were placed small strips of wood to represent the obstructions met with in a road; but these strips of wood came in contact with each pair of wheels at the same time, and never caused any lateral motion. They produced, therefore, a totally different effect from that which takes place in a road, where the action rarely affects more than one wheel at a time, or if two, they are almost invariably those two on the same side of the carriage; consequently, in the model, the wheels in passing over an obstruction, threw the whole weight backwards in a direction exactly opposite to the movement required; while in practice, the carriage is generally thrown sideways, which does not affect its forward motion.

The conclusions drawn from these experiments are, therefore, as might be expected, at variance with practical results, and directly contrary to the opinions of those whose daily experience ought to enable them to judge correctly.

The effects, also, of velocity and momentum must be difficult to imitate in models.

The advantage of placing the load high will not, however, equally apply at low velocities, still less when springs are not used: it may frequently, indeed, in the latter case, produce quite a contrary effect.

In a rough road, the increased force with which the load would be thrown from side to side might prove very inconvenient, and even dangerous, and would certainly be liable to increase the resistance when the front wheels meet with any obstruction: but this it must be particularly remembered is only true in the case of slow velocities and carriages without springs.

We have now considered in succession the various parts of the vehicle for conveying the weight, and shown in what manner they affect the draught, and how they should be constructed so as to diminish as much as possible the amount of this draught. We have endeavoured to point out the advantages and necessity of attending to the construction and size of the wheel. Thus it should be as nearly cylindrical and vertical as possible, and of as large a diameter as can conveniently be admitted. 2dly, That there should be a firm, unyielding connexion in the direction of the movement between the power employed, the weight moved, and the wheels: in other words, that the force should always act directly and without elasticity both upon the load and upon the wheels; and that the impetus or momentum of the load, when in movement, should always act in the same manner, without elasticity in propelling the wheels;—and lastly, that it is highly advantageous to interpose as much elasticity as possible by means of springs in a vertical direction between the wheels and the body, so that the former may rise and fall over stones or irregularities in the road without communicating any sudden shocks to the load; and we believe that the proper application of springs in all cases, even with the heaviest loads, would be found productive of great good effect.

Attention to those points will tend to diminish considerably the amount of draught. As far as regards friction at the axles, and the resistance in passing over obstacles in the road, it will assist the favourable application of the force of traction when obtained from animal power; but that which we have shown to be the most considerable source of resistance is unfortunately least affected by any of those arrangements. We allude to those arising from the yielding or crushing of the material of the road: we have seen that on a good turnpike-road the draught was increased in the proportion of thirty to forty, or about one-third, by the road being slightly dirty; and that, on a heavy, sandy road, the draught was increased to 205, or nearly seven times. Springs will not affect this; and increasing the diameter of the wheel even will be of very slight assistance; nothing but removing at once the prime source of this evil, improving the roads, can remedy this. We are thus naturally led to the third division of our subject, *viz.*, the road or channel of conveyance. In considering this as a branch of the subject of draught by animal power, we shall merely point out what are the principal desiderata in the formation of a good road, and what are the evils principally to be avoided. To enter into all the details of their construction, dependant as it is on the different materials to be found in the neighbourhood, their comparative cost, the quality of the ground over which the road is made, and many other points, would be to enter upon a much more extensive field than is at all required for the proper consideration of the subject of draught by animal power. The requisites for a good road is all that we shall indicate.

Channel of conveyance, in a general point of view, must include canals, roads, and railways. Of the first, however, we shall say little; their construction does not materially affect the amount of draught, and we have already examined the mode of applying the power, and the quantity of effect produced; we shall proceed, therefore, at once to the question of roads.

The inquiry into the best form and construction of wheel carriages has taught us what we might indeed have foreseen, that perfection in a road would be a plane, level, hard surface: to have learned this only would not have advanced us much, as such perfection is unattainable; but we have learned also the comparative advantages of these different qualities of hardness, smoothness, and level. We have come to the conclusion that slight alterations of level which shall vary the exertion required of the animal, without at any time causing excessive fatigue, are rather advantageous for the full developement of his power than otherwise; that the inconvenience of roughness is obviated by the use of springs, and that even when the ordinary carts and waggons without springs are used, still the resistance arising from mere unevenness of surface, when not excessive, is not nearly so great as that which is caused by the yielding of the substance of the road. *Hardness*, therefore, and consequently the *absence of dust and dirt*, which is easily crushed or displaced, is the grand desideratum in roads.

To satisfy this condition, however, smoothness is to a certain degree requisite, as the prominent parts would be always subject to abrasion and destruction: for the same reason, even if for no other, ruts and every thing which can tend to form them must be avoided.

A road should, in its transverse section, be nearly flat. A great curvature or barrel, as it is termed, is useless; for the only object can be to drain the water from it: but if there are ruts, or hollow places, no curvature will effect this; and if the road is hard and smooth, a very slight inclination is sufficient. Indeed, an excess of curvature is not only useless with the present construction of carriages, but facilitates the destruction of the road; for there are few wheels perfectly cylindrical: yet these, when running on a barrelled or curved road, can bear only upon one edge, as in *fig*. 38. The conical wheels still in use, although much inclined at the axle, are never sufficiently so to bring the lower surface of the wheel even horizontal, and therefore are constantly running upon the edge, as in *fig*. 39, until they have formed a rut, coinciding with their own shape. In a barrelled or curved road, the mischief done will, of course, be great in proportion to this curvature. This form is, therefore, mischievous as well as useless. Six or eight inches' rise in the centre of a road of twenty feet wide is amply sufficient to ensure drainage, if drainage is not effectually prevented by ruts or hollow places, and is a curve to which the position of the wheel may be easily adapted.

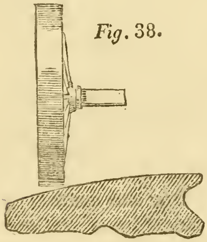


Fig. 38.

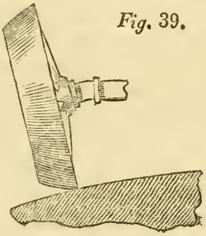


Fig. 39.

The hardness of the surface, the most important feature, will, of course, principally depend upon the materials used, and the formation of the road, and still more upon the state of repair in which it is kept. It is easy to form a good road when the foundation is already laid by the existence of an old one: levelling the surface,—applying a covering of eight or ten inches in thickness of broken stones,—having no round or smooth surfaces, the hardest that can be obtained,—and securing good drainage at the sides is all that is required: but constant repair and unremitting attention is necessary to keep a road thus formed in good condition.

These repairs and attention do not consist in laying on, at certain intervals of time, large quantities of materials, but in constantly removing the sand which is formed, and which, in wet weather, holds the water, and prevents drainage; in filling up as quickly as possible, with fresh materials, any ruts or hollows; and in keeping clear all the drains, and even in scraping little drains from ruts, or such parts of the road as may contain the water, and which it may not be possible immediately to fill up.

By attention to these points, those who are interested in the preservation of the roads, and the expenses attending it, will find that economy will ultimately be the result; and those who are interested in diminishing the labour and expense of draught, we shall only refer again to the table (page 30) of the resistances of a waggon upon different roads, from which they will see, that a horse upon a clean road will do one-third more than upon one slightly muddy; more than *four times* as much as upon new-laid gravel; and nearly *seven times* as much as upon a heavy, sandy road.

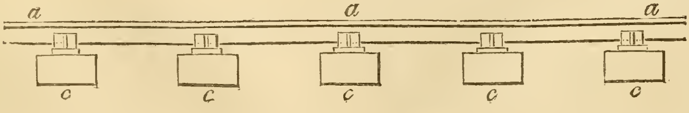
No arguments that we can put forward can at all strengthen the effect that such facts must produce; and we shall, therefore, quit the subject of roads, and conclude our observations on draught by a few words explanatory of the object of rail-roads and their effects as regards diminishing draught.

The great desideratum in the formation of a good road is the facilitating the rolling of the wheels. We have shown that, for this purpose, a hard, smooth surface is necessary; and, as this is only required for the wheels, two longitudinal tracks, of such surface, of proper width, are sufficient for the mere passage of the carriage. If, therefore, there is a considerable traffic between two points along a line of road, without much interruption from crossing, all the qualities of a good road may be obtained in a very superior degree, by having two parallel rails, or tracts of wood or iron, raised a little above the general level of the ground, with a gravelled road between the rails. This is a rail-road. It evidently combines the advantages of a good foot-hold for horses, with those of smooth and hard surfaces for the wheels to roll upon. It requires, however, that the carriages should be all nearly alike, as regards the width and form of the wheels; and experience has proved that such a road is not generally worth constructing, unless the traffic is sufficient to allow of carriages being built expressly for that or similar roads. This being the case, the form and dimensions of the rails, and the general construction of the carriages, are uncontrolled by any other consideration than that of diminishing draught.

A considerable improvement upon this point may, therefore, be expected in the railway over the common road. The railway, as constructed upon the plan at present conceived to be the best, consists of two parallel bars of wrought iron, about two inches and a half broad on the upper surface, and about six inches deep, placed at a distance of about five feet: these bars are supported upon, and firmly fixed to blocks of stone, from one foot to two feet square, and at intervals of three feet.

a a a, *fig*. 40, represents a side view of one of these bars, of which *b* is a section. *c c c* are the blocks of stone on which it rests. *Fig*. 42 is a perspective view of a pair of these parallel bars, constituting together the

Fig. 40.



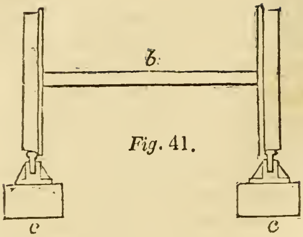


Fig. 41.

railway; and *fig.* 41 represents an end view of the rail with a pair of wheels. The ground is afterwards filled up nearly to the level of the bars, leaving only about one inch of their upper edge exposed: upon this the wheels run. The wheels are generally of cast iron, about three feet in diameter, and slightly conical, with an edge or flange inside, to guide them in the centre of the rails. This brief description is sufficient to give a general idea of the construction of railways, which is all that is necessary for our present purpose. It will be easily conceived that hard, cast-iron wheels, running upon smooth edges of iron in this manner, can meet with but little resistance except those arising from friction at the axle. Accordingly, we find, upon a well constructed railway, in good order, that the resistance does not exceed, in any sensible degree, that which must arise from this cause. It has been found that a force of traction of 1lb. will put in motion a weight of 180, 200, and even, in some cases, 250lb.: so that a horse, exerting an effort of only 125lb., would drag on a level 10 tons. This is about ten times the average effect of his work upon a good common road, and, as it arises entirely from the hardness and smoothness of the road, we cannot conclude our observations by a more striking and unanswerable argument than this, in proof of the immense advantages and saving of expense which would result from greater attention to the state of the roads.

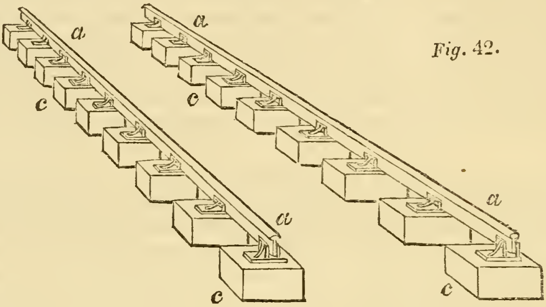


Fig. 42.

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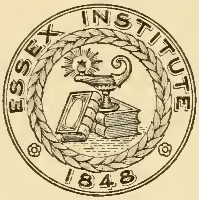
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